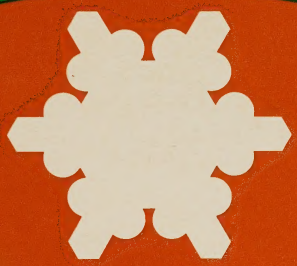
1971 Government Activities in the North

Advisory Committee on
Northern Development



1971 Government Activities in the North

1971 Report and 1972 Plans

Advisory Committee
on Northern Development

This report is also available
in French
Cette publication existe aussi
en version française

FOREWORD

Much of the material used under the headings 'Plans for 1972' had to be assembled in 1971. By the time this document is published, many of these plans will be 'fait accompli'; others may have been severely modified or abandoned. It is not practicable to constantly review the status of these plans as publication of the book proceeds; consequently, they are treated throughout as being in the future.

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MEMORANDUM FOR THE ADVISORY COMMITTEE ON NORTHERN DEVELOPMENT

Document ND 516

Government Activities in the North-1971 and plans for 1972

On January 22, 1953, the Cabinet directed that the Advisory Committee on Northern Development report immediately and periodically thereafter on all phases of development in the Canadian north. The Committee agreed the report should be brought up to date on an annual basis.

This report covers the activities of all federal departments and agencies operating in both Territories for the year 1971 and outlines their plans for 1972.

Due to the co-operation of its many contributors, the report has increased in popularity and is widely used as a work of reference.

It is unclassified and copies can be obtained in either French or English by writing to the Information Services, Department of Indian Affairs and Northern Development, Ottawa, Ontario K1A OH4.

L.A.C.O. Hunt
Secretary

Advisory Committee on
Northern Development
Centennial Tower
400 Laurier Avenue West
Ottawa, Ontario K1A 0H4
Canada

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ADVISORY COMMITTEE ON NORTHERN DEVELOPMENT

Responsibilities

To advise the government on questions of policy relating to civilian and military undertakings in northern Canada, and to provide for the effective co-ordination of all government activities in that area.

Review of 1971 Operations

The ACND under the chairmanship of Mr. H.B. Robinson, Deputy Minister of DIAND, held three meetings in 1971. During the year 14 reports or documents were circulated and a working Group established to study financial implications on Northern Development Policy. The following sub-committees and related working groups were active during the year:

Co-ordinating Committee

Chairman, Mr. A.D. Hunt, Assistant Deputy Minister DIAND
Working Group – Northern Employment
Working Group – Arctic Waters Pollution Prevention
Working Group – Archaeological Salvage
Working Group – Post-Operational Phase Dew Line

Transportation Sub-Committee

Chairman, Dr. T.G. How, Administrator Arctic Transportation Agency of MOT
Working Group – Marine Transport
Working Group – Mackenzie Valley Transport
Working Group – P.O.L. Purchasing Procedures
Steering Group – Marine Transport

Sub-Committee on Science & Technology

Chairman, Dr. J.M. Harrison, Senior Assistant Deputy Minister of DEMR
Executive Group
Working Group – Canada/USSR Scientific Agreement
Working Group – Scientific Guidelines

Sub-Committee on Northern Communications

Chairman, Mr. D.S. Loftus, Northern System Consultant of D.O.C.
Working Group – Community Broadcasting.

Government departments and agencies who previously were not directly involved in northern development, now find themselves committed to programs involving the two Territories, and have become members of the main committee or its related sub-committees and working groups. The membership of the main committee is as follows:

Deputy Minister – IAND (Chairman)
Deputy Minister – Agriculture
Deputy Minister – Supply and Services
Deputy Minister – National Defence
Deputy Minister – Energy, Mines and Resources
Deputy Minister – Public Works
Deputy Minister – Finance
Deputy Minister – Manpower and Immigration
Deputy Minister – National Health & Welfare
Deputy Minister – Transport
Deputy Minister – Communications
Deputy Minister – Environment
Chief of Defence Staff – National Defence
Chairman – Defence Research Board
Under-Secretary of State – External Affairs
President – Canadian Broadcasting Corporation
President – National Research Council of Canada
Secretary to the Cabinet – Privy Council Office
Secretary – Treasury Board
Secretary – Ministry of State for Science & Technology
Commissioner – Royal Canadian Mounted Police
Commissioner – Northwest Territories
Commissioner – Yukon Territory

CANADA DEPARTMENT OF LABOUR

Responsibilities

Conciliation and other services for maintaining good industrial relations; administration of employment standards; fair employment practices, equal pay for women and employee safety legislation; compensation to Public Service employees for occupational injury or illness; surveys of wage rates, hours of labour, and other working conditions.

Long-term Plans

Normal planning to meet responsibilities.

Review of 1971 Operations

INDUSTRIAL RELATIONS

Conciliation and Arbitration Branch

This branch participates in labour relations matters in the Northwest Territories and the Yukon in connection with proceedings under part V of the Canada Labour Code – (Industrial Relations).

This entails:

(1) Preliminary investigation of applications made to the Canada Labour Relations Board by a union seeking to represent a unit or units of employees;
(2) Disputes arising over the interpretation, application or violation of provisions of a collective agreement;
(3) Disputes as to unfair labour practices;
(4) Disputes over the renewal or revision of a collective agreement.

During the calendar year 1971, the following activities were carried out by the C & A Branch in respect to 1, 2, 3 and 4 above:

(1) 10
(2) nil
(3) nil
(4) (a) Conciliation officer appointments – 12
(b) Conciliation boards established – nil

Employee Representation Branch

The Employee Representation Branch is concerned with labour relations matters in the Northwest and Yukon Territories under Part V of the Canada Labour Code (Industrial Relations).

This concerns the following activities of the Canada Labour Relations Board of which the branch is the administrative arm:

- The processing of applications for certification as bargaining agent.
- The processing of applications for revocation of certification.
- The provision of a procedure for the final settlement of differences concerning the meaning or violation of a collective agreement.
- On referral by the minister of labour, consideration of allegations of failure to bargain in good faith.
- Applications for the review and reconsideration of decisions made by the board in the first four items cited.

During 1971 the board received 10 applications from trade unions for certification as bargaining agents of units of employees of employers operating north of the 60th parallel. In addition two cases were dealt with by the board in 1971 which were pending at the end of 1970. In all, there were 12 applications for certification, seven affecting employees in the Yukon and five in the Northwest Territories. In the two Territories the board granted nine applications and rejected three.

There are no plans to expand the activities of the Employee Representation Branch in the north. These activities are governed entirely by the number of applications submitted to the Canada Labour Relations Board.

Fair Employment Practices Branch

The Fair Employment Practices Branch of the Canada Department of Labour is responsible for investigating complaints of discrimination on grounds of race, colour, religion or national origin within federal jurisdiction, and for promoting equal employment opportunity for disadvantaged minority groups.

During 1971-72, the Fair Employment Practices Branch investigated and settled one complaint of discrimination within the jurisdiction of the Northwest Territories. In that instance we acted at the request of the Territorial government, since both the Yukon Territory and the Northwest Territories have their own fair employment practices ordinances. In the case of one or two other complaints, we referred them to the appropriate Territory and we were not asked to assist.

During 1972-73 the branch will be working with the special staff group on employment and economic development and other elements in the Department of Indian Affairs and Northern Development to plan initiatives to increase employment opportunities for native peoples in the north.

EMPLOYMENT STANDARDS

Labour Standards Branch

Federal Contracts

– Inspections of Government contracts: During 1971, 43 inspections were made by branch officers. Of these, 24 were made in the N.W.T. and 19 in the Yukon. These inspections directly affected 27 main contractors and 16 sub-contractors. Wage adjustments were collected from six main contractors involving $37,185.16 and paid to 80 employees.
– Wage schedules issued:

	N.W.T.	Y.T.
Construction	64	27
Service	5	2

Standards Division

It should be noted that the provisions of Part III of the Canada Labour Code (Labour Standards) do not apply to a local or private work, undertaking, or business in the Yukon Territory or the Northwest Territories. The Territorial Councils have issued ordinances respecting employment standards in activities that fall within their jurisdiction.

In the Yukon and Northwest Territories, responsibility for investigation of complaints under the code has been assigned to the Labour Standards Branch regional offices in Winnipeg, Edmonton and Vancouver, as follows:

Territory	Responsible Regional Office
—Northwest Territories (east of 102° longitude)	Winnipeg, Manitoba
—Northwest Territories (west of 102° longitude)	Edmonton, Alberta
—Yukon	Vancouver, B.C.

During 1971 there were five complaints investigated under Part III of the Canada Labour Code (Labour Standards), of which two were in the Northwest Territories and three in the Yukon. As a result of these investigations, the sum of $871 was recovered.

In the same period there were seven routine inspections carried out under the same authority, two of which were in the Northwest Territories and five in the Yukon. The sum of $251 was recovered on behalf of two employees from one firm. Verbal and written instructions were given to an additional four firms with regards to maintenance of proper records to comply with section 66(2) of the Canada Labour Code, Part III — (Labour Standards).

Plans for 1972 will be similar to those of 1971 and the anticipated results of our activities would vary only slightly from those of the past two years.

Accident Prevention and Compensation Branch

In addition to its long-standing presence in the Yukon and Northwest Territories administering the Government Employees Compensation Act, the Accident Prevention and Compensation Branch of the Department made considerable progress towards implementing a comprehensive employment safety program in premises of employees subject to Part IV of the Canada Labour Code as well as in Public Service premises under the authority of the Occupational Safety Policy for the Public Service of Canada.

Accident Prevention Division

Surveys

As part of regular safety audit, visits were made to a representative sampling of airports and Department of National Health and Welfare sites in the Territories. A safety audit was conducted of the operations of the Northern Transportation Company Limited in the Northwest Territories. This was followed by an accident investigation seminar in Edmonton, Alberta, for all of that company's agents.

Routine visits were made to over 50 public service and federal enterprises in eight main centres throughout the Territories to establish contacts and evaluate employment safety standards. In addition 153 general safety inspections were made by the British Columbia Department of Labour inspector acting as a federal safety officer, as part of a special survey to evaluate safety standards in the Yukon.

An agreement was negotiated with the Government of the Northwest Territories to conduct regular inspections of boilers and pressure vessels owned by federal government departments and federal enterprises. During the period 1 April 1971 to 31 December 1971, 328 boilers and pressure vessels were inspected.

Safety Training

Arrangements initiated in 1970 with the St. John Ambulance for first aid instruction were continued in 1971. Forty-eight persons were trained. Arrangements are being made to have a full-time instructor for the Northwest Territories so that training may be on a regular basis.

Safety Councils

As a pilot project a safety council was established at Frobisher Bay to stimulate continuous local safety program development and safety monitoring in all public service and federal enterprises in the area. Although the reception was not as good as early response to the idea would have suggested, attempts are to be made to form other councils elsewhere in the Territories.

Accident, Compensation Division

Claims of federal government employees, usually employed in the Yukon and Northwest Territories, for compensation for occupational accidents or diseases were received in the branch and forwarded to the Workmen's Compensation Board of Alberta for adjudication and payment under a federal-provincial arrangement. A total of 499 claims was received and disbursements were $163,595.

Plans for 1972

It is planned that all major work centres and mechanical facilities will be visited during 1972. A regional safety audit of the Northern Canada Power Commission in the Northwest Territories, including a survey of 50 electrical generating stations, is planned. A large number of small federal establishments, which individually would not warrant being surveyed, will be visited as part of this safety audit tour.

Negotiations with the Yukon Territorial Government will be pursued to establish regular inspections of boilers, pressure vessels and other mechanical installations. Expansion of the existing agreement with the Government of the Northwest Territories to include electrical installations is planned.

CANADIAN BROADCASTING CORPORATION

NORTHERN SERVICE RADIO STATIONS

CFFB FROBISHER BAY, N.W.T.* (1210 kHz/250 W)

CHFC FORT CHURCHILL, Manitoba (1230 kHz/250 W)

CHAK INUVIK, N.W.T. (860 kHz/1000 W)

CFWH Whitehorse, Y.T. (570 kHz/1000 W)

CFYK YELLOWKNIFE, N.W.T. (1340 kHz/1000 W)

*No CBC Network connection; news received via shortwave, network programs on tape recordings.

NORTHERN SERVICE LOW-POWER RELAY TRANSMITTER STATIONS

(Unattended radio stations broadcasting from the network)**

CFWH is the program centre for the Yukon LPRT** Network:

Carmacks (990 kHz/40 W)
Mayo (1230 kHz/40 W)
Elsa (560 kHz/40 W)
Dawson City (560 kHz/40 W)
Clinton Creek (990 kHz/40 W)
Teslin (940 kHz/40 W)
Swift River (970 kHz/40 W)
Watson Lake (990 kHz/40 W)
Cassiar (1340 kHz/40 W)
Haines Junction (860 kHz/40 W)
Destruction Bay 940 kHz/40 W)
Beaver Creek (690 kHz/40 W)
Faro (1230 kHz/40 W)

Pacific Network

Fort Nelson (1240 kHz/40 W)

CFYK is the program centre for the Mackenzie LPRT** Network:

Hay River (1490 kHz/40 W)
Pine Point (880 kHz/40 W)
Fort Smith (860 kHz/40 W)
Uranium City (880 kHz/40 W)
Fort Chipewyan (1450 kHz/40 W)
Fort Providence (1230 kHz/40 W)
Fort Simpson (690 kHz/40 W)
Norman Wells (990 kHz/40 W)
Fort Good Hope (920 kHz/40 W)
Fort Resolution (1150 kHz/40 W)
Wrigley (1280 kHz/40 W)
Fort Norman (920 kHz/40 W)
Rae/Edzo (1440 kHz/40 W)

Future Affiliated Stations

Tuktoyaktuk (600 kHz/1000 W)

NORTHERN SERVICE FRONTIER TELEVISION STATIONS

WHITEHORSE – CFWH – TV
WATSON LAKE – CBTE – TV – 1
CASSIAR – CBTD – TV
FORT NELSON – CBTD – TV – 1
CLINTON CREEK – CBTE – TV – 2
DAWSON CITY – CBTE – TV – 3
ELSA – CBTE – TV – 5
FARO – CBTE – TV – 6
YELLOWKNIFE – CFYK – TV
URANIUM CITY – CBTA – TV – 1
INUVIK – CHAK – TV
PINE POINT – CBTE – TV
FORT SMITH – CBTE – TV – 4
FROBISHER BAY – CFFB – TV (on air Feb. 1/72)

NORTHERN SERVICE

Responsibilities

To provide a broadcasting service to meet the special needs of the people living in the north – Indians, Eskimos, Métis and whites – and give them a sense of identity with people living in the rest of Canada and to inform the Canadian public about the north. The Northern Service meets these responsibilities by means of medium-wave and short-wave radio and, to a limited extent, television.

Long-term Plans

The launching of Canada's domestic communications satellite Anik in late 1972 will provide live network television service where there are Telesat Corporation ground receiving stations and CBC television broadcasting stations. There will be 25 television receiving stations (TROs) in the initial phase; 14 of them will serve CBC Northern Service Frontier Coverage Package (FCP) television stations. Anik will eliminate the CBC's FCP delayed-tape television service. It will not be possible to pick up the satellite signal on home receivers unless there is a local CBC television transmitter. Television coverage will also be expanded by using re-broadcast stations and microwave facilities.

The Northern Service will continue to expand its radio network to new areas as the common carriers provide facilities. Short-wave service to the north will be improved with the completion of the antenna system and the five new 250 kilowatt transmitters at CBC's Northern Service station near Sackville, N.B.

Review of 1971 Operations

On 6 July a low-power relay transmitter (LPRT) went into operation at Rae/Edzo, NWT. A FCP television station started operations at Faro, YT on 9 August 1971.

Additional office space in the Brown Building at Frobisher Bay, NWT was rented for station CFFB in October. The CFWH and CFWH-TV operations at Whitehorse were consolidated on the ground floor of the Casca Building.

In trying to give the northern FCP television service a more personal flavour, special graphics, artwork, photographs and 'voice-over' material were drawn from northern communities, and various public and private sources.

A new communications technique, designed to encourage community involvement and development through the combined use of telephones and radio broadcast, was inaugurated as an experiment in October at Rankin Inlet, NWT. Called *Comminterphone* – for Community Interaction Telephone – the unique experiment is a joint undertaking of the Canadian Broadcasting Corporation, Bell Canada, the federal Department of Communications, and Bell-Northern Research. The Comminterphone combines the use of residential telephones with medium-wave radio. By dialing a designated number, up to four persons may hold a conversation that can be aired over a low-power radio transmitter and broadcast within a five-mile radius. The broadcast can be received by anyone listening with an AM radio receiver within that area. Listeners wishing to add comments to the issue being discussed, make an announcement, or contribute to programming over the system would simply dial the number to get on the air. The sponsors hope that the information and experience gathered from the one-year experiment will improve current communication techniques and improve community relations.

Programs

The broadcasting day is usually 19 hours, although it may be extended for special occasions. Not all national network programs are suited to northern conditions, and not all are broadcast. This selectivity increases the program responsibilities of local staff, but at the same time improves the opportunities to provide local service.

While television has already had a great influence on the communities that receive it, radio continues to be the vital medium of communication.

The broadcasting of personal and public messages continues undiminished. The messages take various forms, although community announcements are the commonest. Personal messages are broadcast three times daily on Delta Roundup by station CHAK, Inuvik. Other messages are recorded by Indian and Eskimo patients in Inuvik Hospital and broadcast on CHAK's Patients' Program each week. Tape recordings of programs in Indian and Eskimo produced at other northern stations also help to keep hospital patients in touch with home. Patients and students in more distant parts of the country make use of CBC message postcards. These are mailed to the station nearest their home, and their greetings are broadcast to family and friends. The cards are used also by people living in the isolated communities of the eastern Arctic to keep in touch with each other by radio. They are incorporated into such programs as *Teekrekaat Inoonoot*, produced and broadcast by Station CFFB Frobisher Bay, and *Ugausit* by Station CHFC Fort Churchill.

Another CHFC program of this kind, aired three times a month, contains messages from the Churchill Dene (Chipewyan) village people to those families and friends who have moved away to live in North Knife Lake, a bush settlement 75 miles to the west. At present, there are about 35 residents of this outlying settlement.

Through its network of LPRTs, CFYK Yellowknife passes messages to the public from the Yellowknife Hospital every day. Communications among people concerned with mining, explorations and ecological studies are also carried by this system. Northern Messenger, now a daily short-wave program, continues to carry greetings in English and French from people in the south and around the world to relatives and friends in the Arctic.

Tape recordings of special northern region programs are flown to Montreal and made available for future broadcast by exchange within the region or by short wave. For example, CHFC Fort Churchill produced a five-part series entitled *The Badmen of the West*, which examined the lives and activities of the early outlaws. The series was distributed to all stations and listed in the CBC's Regional Exchange Catalogue for use by all CBC radio stations.

Weather forecasts are no longer the simple matter they were in early broadcasting days. In addition to daily temperatures and wind strengths, detailed weather forecasts for land, water and air are now standard.

During August and September, some regular program time was pre-empted for reports on forest fires in both Territories, culminating in evacuation instructions broadcast to residents of Pine Point, NWT. Fortunately, evacuation was not required before the local fires were controlled.

Using mobile equipment, most northern spring festivals and carnivals were covered by the regional stations. These events enjoy considerable public participation, and for those who must remain at home or who attend one race and want to follow another, radio coverage is a great asset.

Holiday, a summer radio presentation of the national network, allowed the Northern Service to inform Canadians about the Canadian Arctic and sub-Arctic, its peoples, their summer activities, and its wildlife. It will continue in the summer of 1972. Daily

programs for tourists are produced at Whitehorse and Yellowknife during the summer months. Last summer, *Trails of '71* originated from all points of entry into the Yukon.

A summertime tourist program, *Travel North*, was organized over the Mackenzie Network to provide a dialogue between tourists and northerners. The program won its producer a Travel Arctic commemorative plaque for helping to promote northern tourism.

Information programming is broadcast in various languages on all northern stations. All stations broadcast local, regional or Territorial news daily, and these programs are like those carried elsewhere by CBC. A freelance news correspondent at Ottawa files news stories of interest to northerners. Locally, the news editors write and record items gathered by staff and correspondents in their area. There is an increasing exchange of news reporting between stations in the north and with national and regional newsrooms to the south. Yellowknife prepares news in several Indian languages as well as in English. Inuvik, Frobisher Bay and Fort Churchill prepare news programs in Eskimo. Daily news in Eskimo is included in the newscasts prepared at Montreal for the northern short-wave service. In addition, the shortwave service broadcasts a weekly review of Territorial news prepared at Yellowknife.

Station CFFB Frobisher Bay relays these and other news programs from the short-wave service, although network connections are made to Frobisher Bay when special events warrant the great expense. When short-wave reception is poor, a back-up news service is provided by telephone to Frobisher Bay. All stations cover special events as they happen – federal, Territorial and civic elections, the Yukon and NWT council sessions, visits by important persons, Apollo flights to the moon, and emergencies. These special events are also broadcast in the Indian and Eskimo languages. Several conferences were given special coverage, including the Manitoba Métis Federation Conference in Thompson, the Indian/Eskimo Conference in Whitehorse, the University of Canada North Conference in Inuvik, and the Arctic Liberal Conference in Inuvik and Whitehorse.

Hudson Weekly is a half-hour look at the week's news in and around Fort Churchill. The program selects major news events and presents them in depth. A Slavey-language program, *Goodee*, was inaugurated on CFYK and produced by the Fort Simpson Co-op. It is a weekly news review, usually using material translated from *Territorial Roundup*. *Directions '71* was broadcast in January on the Mackenzie Network and the two other CBC stations in the Northwest Territories. This program has become an annual production giving listeners a survey of the previous year and a hint of what might be coming in the next. Newsmen from the Yukon and NWT stations accompanied the Territorial commissioners and councillors on northern tours and filed daily reports.

Full-scale documentaries are usually undertaken as regional productions for broadcast on the national network program *Between Ourselves*. For example, Faro, YT, looked at one of the newest towns in the north; *The Dogrib Indians of Fort Rae, NWT*, was an examination of the community's history, its people and the results of their decade-long labours to make themselves self-supporting; and *The Diminishing Majority* was a study of the changing role of Indians and Eskimos in Canada's north as resource development brings a growing number of non-natives to the area. The latter program focussed on Inuvik, where the white population is now greater than the native.

Open-line programs such as *Chronicle*, produced in the past year at Station CHAK Inuvik, and *More Than Music* from Yellowknife reached out by telephone for comment by informed persons in Ottawa and elsewhere, including all the communities served by the Yukon and Mackenzie Networks. Local government, education, employment, the rights of the native people, the latest budget, taxation or pollution controls in the Arctic were some of the issues discussed. During favorable weather when the LPRT locations can be reached, *More Than Music* broadcasts from those communities on a monthly basis. Broadcasters invite local people to telephone in and discuss a subject of topical significance, like the merits of a song called *Muktuk Annie* or the book *Nunanga*. In March, the national network broadcast *Cross Country Check-up* originated in Inuvik, and was hosted by the Committee of Original People's Entitlement (COPE) and in November, CHFC Fort Churchill produced a special open-line program on drugs.

In 1971 Yukon's *Speakout* high-school debate series involved the new mining community of Faro for the first time, in addition to Watson Lake, Mayo, Dawson City and the two secondary schools in Whitehorse. The debates took place as "remote", out-of-studio broadcasts, before the public in the communities participating.

CFYK Yellowknife produced an hour-long special program on the problems of preparing specialized northern curricula for NWT schools. In association with the local adult education centre, CFFB Frobisher Bay began a series of programs in Eskimo entitled *The Wooden Igloo*, which covers subjects varying from consumer education (budgeting, diet, bulk buying, selective shopping) to more general topics like banking, taxes, census taking or how to find work.

A special follow-up program on taxation was broadcast over CFFB Frobisher Bay to Eskimo listeners. It was produced with the co-operation of the NWT government and the local adult education centre. The taxation form was translated and discussed in detail. Before the end of April, more than 150 Eskimo residents of Frobisher Bay had applied for further help with their tax forms.

In October, CFFB Frobisher Bay, in co-operation with the local adult education centre, produced and broadcast a special program, *Meet Your Teacher*, introducing local teachers to the community. Discussions compared teaching in the north and south, and considered the difficulties of adapting southern curricula to meet northern circumstances. English discussion was followed by summaries in Eskimo.

On the Mackenzie Network, a series of two-minute announcements entitled *This is the Law* are broadcast each day during the morning programs. They clarify points of law and are produced with the assistance of the local member of the RCMP.

Each northern CBC station has its own approach to consumer programming. For example, part of this kind of programming at CHFC Fort Churchill is *Tradeo*, during which local people are invited to call in to buy, sell or barter over the air. With particular concern for the needs of Indian people, the Yukon Network undertook both a daily consumer program and a new series on the Indian and the law.

In keeping with recent alterations to CBC-AM national network programming, the northern stations have enlarged their morning shows to integrate the national network and local programs. For example, at CFFB Frobisher Bay, the regular Eskimo morning program *Ullasui* has been broken into three 20-minute segments interwoven with the national network's *This Country in the Morning*, in order to integrate rather than segregate. *Ullasui* has a large following among Eskimo women.

The program service in the Eskimo and Indian languages continues to expand and covers a wide range of information, interests and concerns. *Inoonoot Ookalleemagat* (Eskimo Magazine), is a CFFB Frobisher Bay program interpreting and reporting on Canadian and world events; *Klahowya* (Hello) by CFWH, Whitehorse, has searching reports on such subjects as unemployment and housing for Indian people in the Yukon; and *Ozong Renda* (The Good Life) by CFYK, Yellowknife features health talks, notes on job opportunities, and reports on efforts to create an organization uniting all the Indian people in the Mackenzie District.

A program produced by the Alberta Native Communications Society in Cree and English is being broadcast over the Mackenzie Network. It contains traditional Indian music, news centering around Fort Chipewyan and general regional and national information of interest to Alberta natives.

Agreements were signed in August 1971 between the CBC Northern Service, the Yukon Indian Brotherhood and the Committee for Original People Entitlement for collaboration in preparing a series of native community-development programs in English, Loucheux and northern Arctic Eskimo. The Yukon-based program in English is called *Dun Quandro* (The Indian Tells a Story).

The titles *Tinkzoo Gikyik* and *Innuit Nipatt* both mean "A Native Voice". Both programs, broadcast weekly by CHAK Inuvik in Loucheux and Eskimo, contain interviews, news and public affairs discussions. On short wave, *Nallachine* (Things to Listen to) is a daily half-hour in Eskimo, produced in Montreal from material gathered throughout the north and south. Although *Indian Magazine* became a national network program in 1969 (the Northern Service launched it in 1964), northern stations continue to contribute and make local local additions to it.

Youth is served not only through popular music but also by such programs as *CVC Calling*, produced in English and Eskimo by Churchill Vocational Centre students. It contains news, sports news, music, interviews and interesting things about school activities and youth in general. Occasionally, messages from Whale Cove and Eskimo Point students are broadcast to their families.

The Native Studies Program, a series produced by the regional production centre in Montreal for broadcast over the northern stations and short wave, includes highlights from lectures on Indian history and culture given by leading Indian authorities in the native studies program at Loyola College, Montreal. The native students taking part in the radio program discuss items which interest them in the lectures, and express related views. Occasionally programs in this series are broadcast by the national network.

Local choral concerts are featured on the Yukon and Mackenzie Networks, expecially at Christmas and Easter. More popular are the live productions, usually undertaken in the winter with country and western and rock groups. Regional series of this kind have been produced at Whitehorse, Fort Churchill, Inuvik and Yellowknife. A long-planned series of music programs featuring the 40-piece RCMP Band was completed by the regional production centre in co-operation with CBC Ottawa. This series of eight programs, with Eskimo and Indian commentary as well as English, resulted from the popularity of the band during a northern tour in 1970.

Northerners are keenly sports-minded. Regular curling bonspiels, hockey games, softball matches and so forth, were either summarized or reported play-by-play by all stations. Coverage also was made of the Northern Games at Inuvik and all Arctic Winter Games trials. The northern stations and the short-wave service carried the special reports from CHAK Inuvik on the Top-of-the-World-Cross-Country Ski Meet in the Mackenzie Delta, in which contestants from Alaska and Scandinavian countries competed with Yukon and NWT skiers. CFWH Whitehorse learned a new nomenclature when they covered the Canadian Amateur Wrestling Championships, held in the Yukon for the first time.

Northern listeners to short-wave broadcasts were also kept up-to-date with daily summaries of national and international sports prepared in Montreal by the Northern Service. Special provision was made to give northern listeners broadcasts of selected western conference and interlocking league football games.

Religious broadcasting is largely inspirational and pastoral. All eligible denominations are invited to participate in daily *Thought for Today* programs and church service on Sundays. Churchill has experimented with a religious magazine program in place of the church service in Eskimo, Indian and English. Special broadcasts are made locally on major church festivals.

One of the most important developments by the Northern Service has been in drama. All stations have produced dramas by local groups, usually performing from prepared scripts. The greatest breakthrough has been in the development of dramas in Eskimo and more recently Indian. CHAK Inuvik continued its weekly program of legends and stories, *A Long Time Ago*, narrated in either Loucheux or Eskimo, with English translations.

Two native announcer/operators left the Northern Service to take an 18-month training course with the National Film Board. It is hoped they will rejoin the service at the completion of the course in positions enabling them to make use of their knowledge and skills.

During the year, the Northern Service headquarters in Ottawa and regional production centre in Montreal were visited by a delegation from the government and the Educational Broadcasting Commission of Alaska. Aspects of native broadcasting and technical operations of the service were discussed. In Frobisher Bay, talks were held between the local CBC station manager and officials from Greenland. Arrangements were made for an exchange of programs with Radio Greenland on Canadian and Eskimo social, economic, political and cultural activities.

In Whitehorse the area manager was special guest at the opening of a closed-circuit French-language radio station run by students and staff of a local elementary school. He had encouraged the idea of a simulated radio station and helped to design and build it.

Plans for 1972

Operations

The installation of a Frontier Coverage Package television station at Frobisher Bay, NWT, will be delayed until early 1972 because of equipment delivery problems.

Planning will be done for the establishment of a low-power relay transmitter and television re-broadcasting station at Fort McPherson, NWT. Plans for establishing a television re-broadcast station for Mayo, YT, will go ahead.

The necessary video and audio interconnection between Telesat Canada's television receive-only ground stations and all the northern Frontier Coverage Package television stations will be made this year in time for the launching of the domestic satellite Anik, which will bring live network television service to the north.

The new Northern Service short-wave antenna arrays and installation of the new 250 kw transmitters will be completed at Sackville, N.B. These new facilities should

greatly improve short-wave transmissions to the north.

The community radio station at Tuktoyaktuk will become a CBC affiliate early in the year.

Programs

Plans include:

- the inauguration of a northern short-wave service of information programming to those listeners who understand only Cree and who live in the Hudson Bay area.
- Phase III of the Native Studies program, *Winds of Change,* which the Northern Service produces in co-operation with Loyola College, Montreal.
- Continuation of the children's program in English, *Adventures of Ookpik*, in which Ookpik the arctic owl is caught up in adventures with northern friends as he and his Eskimo companion, Anik, explore all sorts of exciting situations familiar to the people of the north. The program series is being distributed throughout the world via the CBC international transcription service.
- Contributions to *Between Ourselves* for national network broadcast will be *Build Me a Highway*, produced by CFWH Whitehorse, which will tell the story of a highway from conception to realization and will look particularly at the recreational, environmental and economic effects of a major road link between the Northwest Territories and the Yukon.
- *The Disappearing North*, a regional production centre program which will study certain features of life that have vanished and others that will change beyond recognition through resource development in the north.
- A series marking the hundredth centennial in 1972 of the RCMP will be researched for later production.
- Northern-oriented cooking features will be broadcast as part of the continuing Eskimo program *Nallachine*. Recipes printed in Eskimo and English will be sent out to listeners who verbally request them, since listeners often lack writing materials at the time of broadcast.
- *The Inuit Speaks His Mind*, a publication in English summarizing the opinions and comments expressed in Eskimo broadcasts, will be sent to persons and agents with some interest, responsibility, or concern for the north.

Responsibilities and Long-term Plans

Canadian National is interested in developing a commercially viable transportation and communication network in the north. The groundwork for such a system has been laid in the last decade. Along with experience in the training of indigenous people and environmental control, it will form the basis from which CN will expand and participate in the development of the Canadian north.

Review of 1971 Operations

Canadian National in 1971 continued successfully to operate the Alberta Resources Railway (under a lease agreement with the Alberta Government), the Sherridon-Lynn Lake line, and the Great Slave Lake rail line to Hay River and Pine Point.

Canadian National Telecommunications continued to expand its northern telecommunication facilities to meet the growing demand for service.

Various studies to determine the transportation needs of Canada's north and how they may best be met were carried out. To assess CN's long-term market opportunities a study of supply and demand for the mineral resources of the north along with a catalogue of location, extent, and size of proven and probable mineral deposits was developed. In addition the potential of several modes and possible routes of transportation were evaluated. To complement this research CN, together with Alberta Gas Trunk Line Company Ltd., financed a study of the economic and technical feasibility of a pipeline to carry natural gas from Alaska through the Northwest Territories and Yukon to markets in Canada and the United States.

In 1971 Canadian National became a member of Gas Arctic Systems Study Group, a consortium of six major Canadian and U.S. gas and transportation companies which is examining all aspects of the construction of a gas pipeline running 1,550 miles from Prudhoe Bay down the Mackenzie Valley to Northern Alberta.

Plans for 1972

Canadian National expects to continue its participation in various northern transportation studies. Developments in the north will be closely monitored to identify when expansion of existing facilities becomes necessary as well as to determine that mode or combination of modes most suitable to meet increased demand.

AIR TRANSPORT COMMITTEE

Responsibilities

The licensing of air carriers to operate commercial air services; the economic regulation of air carriers; investigations and surveys relating to the operation and development of commercial air services in Canada and advising the minister of transport on matters relating to civil aviation.

Long-term Plans

Normal planning to meet responsibilities.

Review of 1971 Operations

GAP Pine contracts were awarded to Labrador Airways Ltd. and Eastern Provincial Airways (1963) Ltd. as follows for the period July 1, 1970 to June 30, 1971:

Labrador Airways Ltd.

Between Goose Bay — Hopedale and return

Between Goose Bay — Saglek/Resolution Island and return

Eastern Provincial Airways (1963) Ltd.

Between Goose Bay — Stephenville and return

The DEW Line contracts for the period 1 July 1970 to 30 June 1971 were awarded to:

Vertical DEW Line airlift — Transair Ltd.
Lateral DEW Line airlift — Nordair Ltd.

Supervision and co-ordination of these contractual arrangements continue.

After the 1970 Arctic Transportation Conference held in Yellowknife in December 1970, an inter-departmental working group was convened "to conduct a review of air transportation in the north" and specifically to prepare:

"(a) An up-to-date description of existing scheduled and charter air services in the Northwest Territories and the Yukon;

(b) An up-to-date summary of air traffic trends in the north;

(c) An indication of discernible gaps in both services and facilities."

Representatives from the Economics Division of the Air Transport Committee and the Research Branch of the Canadian Transport Commission were members of the working group. A confidential report was prepared for limited distribution to those departments principally concerned.

Plans for 1972

Normal planning to meet responsibilities.

CENTRAL MORTGAGE AND HOUSING CORPORATION

Responsibilities

- Design of housing, preparation of town development plans, and drafting of planning legislation as requested from time to time by the Department of Indian Affairs and Northern Development.
- Financing of housing under the terms of the National Housing Act.

Long-term Plans

The facilities provided under the National Housing Act and the services of the corporation will be made available wherever and whenever they are required.

Review of 1971 Operations

Lending Activities

In 1971 a total of 413 new housing units was financed under the NHA compared to 506 units in the previous year. Of these, 85 units were in the Yukon and 328 in the Northwest Territories. Approved lenders provided funds for 74 units in the Yukon and 303 units in the NWT. CMHC made loans for 11 units in the Yukon and 25 units in the NWT.

The corporation made eight house loans in the NWT and one in the Yukon.

In addition CMHC provided funds for the construction of a 10-unit low-income family housing development in Hay River.

The second-mortgage plan provided by the governments of the Yukon Territory and the Northwest Territories, as an addition to the loans available under the National Housing Act, continued in operation. CMHC administers the plan on behalf of the Territorial governments and during 1971 made 10 such loans in the NWT and nine in the Yukon. This brought the total number of second-mortgage loans to 117 since inception of the program in 1962.

Partnership Activities — Yellowknife

Land Assembly

During 1971 eight lots were sold in the two land assembly projects developed in the previous years. Two blocks and 68 lots remain unsold.

Public Housing — Low-Income Families

A study is being done on the feasibility of financing approximately 36 units for low-income families.

Partnership Activities — Hay River

Land Assembly

A study of a land assembly of about 82 lots is under way.

Public Housing — Senior Citizens

A feasibility study is being done for the financing of approximately 10 units for senior citizens.

Partnership Activities — Fort Smith

Public Housing — Low-Income Families

In May 1971 a contract was awarded for the construction of 12 three-bedroom and eight four-bedroom semi-detached units for families of low-income. As of December 31, construction was 98 per cent complete.

Partnership Activities — Fort Simpson

Public Housing — Senior Citizens

In September 1971 a contract was awarded for the construction of eight units for senior citizens. As of December 31, construction was 80 per cent completed and the anticipated completion date is July 1972.

Partnership Activities — Inuvik

Public Housing — Senior Citizens

In September 1971 a contract was awarded for the construction of 10 units for senior citizens. The anticipated completion date is July 1972.

Partnership Activities — Fort McPherson

Public Housing — Senior Citizens

Order-in-Council approval was received in September 1971 for the construction of eight units for senior citizens. A call for tender for this project resulted in costs considerably higher than was estimated. The design and specifications for the building are being reconsidered and it is anticipated that a new call will be made in early 1972.

Partnership Activities — Whitehorse

Public Housing — Low-Income Families

Order-in-Council approval was received in November 1971 for the construction of 40 units for low-income families, consisting of 30 three-bedroom and 10 four-bedroom detached housing units. A proposal call for this project closes in February 1972.

Research Grants and Studies Under Part V, NHA, 1954

In 1971 no Part V grants were given in the Territories. There is continuing support for a research program in the Whitehorse area under a Part V grant of $35,000 given late in 1970 to the Yukon Native Brotherhood Association.

Plans for 1972

The following public housing proposals are under discussion:

Hay River	24 family units
Hay River	10 senior citizens units
Inuvik	30 family units
Fort Good Hope	8 senior citizens units
Frobisher Bay	10 senior citizens units
Yellowknife	24 family housing units
Yukon Territories	Proposals still to be made

CROWN ASSETS DISPOSAL CORPORATION

Responsibilities

Crown Assets Disposal Corporation is responsible for the sale of surplus assets reported by government departments and agencies operating in the north, and under a long-standing agreement conducts the sale of United States government surplus property at DEW Line sites and other northern establishments. Under an agreement completed during the year, the corporation will also act as agent of the Government of the Northwest Territories in the sale of their surplus assets.

Long-Term Plans

The corporation will continue to provide a sales and liaison service to federal government departments and to United States government agencies, in the sale of their surplus assets in the north.

Review of 1971 Operations

Special sales were conducted during the summer and autumn at Whitehorse, Churchill, and Goose Bay. Of particular interest was the sale of equipment and supplies at DEW station Rowley Island to the Government of the Northwest Territories.

Plans for 1972

The corporation will conduct normal sales operations and be ready to assist in any special disposal problems that may arise at Canadian or U.S. establishments.

Responsibilities

- To provide technical assistance through consultation and research to those needing information on matters of food production.
- To provide an identification and consultative service on insects, arachnids, nematodes, plants, and soils to meet Canada's scientific and operational requirements in the north.

Long-term Plans

To maintain our present low level of operation in the north unless future developments indicate a need for greater activity. See below for detailed plans.

Review of 1971 Operations

Northern Research Group, Beaverlodge, Alberta

Slave River Lowlands were soil-mapped in 1965. Indications are that some two million acres are potentially arable. Of this amount slightly over one million acres occur on open or semi-open land supporting a mixture of grasses and sedges with varying amounts of willow and aspen. Most of the areas are poorly drained; however, they do vary from a true prairie grassland to a wet sedge meadow.

Research for the area is carried out at Grand Detour, 35 miles north of Fort Smith. Here three major soil types have been studied since 1968 in relation to yield and quality of native vegetation and adaptability of introduced forages.

It has been found that nitrogen is the only fertilizer nutrient which limits yield both for native grass sedge hay and for brome alfalfa stands. Depending upon the soil type and the year, native grass produces 1000-5,000 pounds of dry matter per acre. The protein level in June is 15 per cent and drops to 7 per cent in late August. The drier associations show lower quality than the wet sedge forage. The seeded stands vary from 1,500-2,000 pounds of dry matter. Cereal crops planted in late May have never matured in three years of testing.

Mean temperature in °F, with average high and average low for four years was: June 62, 86, 23; July 65, 85, 29; August 60, 85, 23. The rainfall averaged 4.40 inches for the three summer months with a low of 3.73 inches in 1969 and a high of 6.05 inches in 1970. A comparison was made between the climate of an open windswept area and a more treed site. This indicated that the former had slightly higher mean temperatures, more wind, higher evaporation and more rain than the latter. Soil temperature may be the factor limiting plant growth, as even in July it rarely goes above 55°F at six inches. No month is free of a killing frost. On the average, five days each summer have temperatures below 28°F.

At present the meadow areas are used only by bison. These wild ungulates range over the entire area and, even where they occur in sizable herds, cause little reduction in the total vegatation produced.

Because this study involves a range area and because it has some relationship to the buffalo of the Northwest Territories, the officer-in-charge of the project was seconded to the Peace-Athabasca Delta project from May 21 – 26, 1971, to help make an assessment of the bison potential of the delta area of Wood Buffalo Park.

The Grand Detour substations will continue to gather data for two more years.

Entomology Research Institute, Ottawa, Ontario

Three research scientists spent about five weeks each collecting insects in the Tuktoyaktuk area, on Herschel and Hooper islands, and at Atkinson Point. About 700 species were gathered. The collection filled in a major gap in knowledge of the distribution of insects in the north. It also provided data on the effectiveness of the Mackenzie River Valley as a barrier to the eastward dispersal of northern Yukon and Alaskan species.

Several papers on arctic insects were published or submitted for publication, including studies on the overwintering of aquatic insects, an account of the insects occurring on Bathurst Island, and studies on the seasonal and diel emergence of chironomid midges.

Plans for 1972

The Institute has undertaken to identify the aquatic insects collected by the Fisheries Research Board in their study of the benthic fauna of the Mackenzie River and its tributaries. Approximately 35,000 specimens will be submitted for identification. Two research scientists will collect and study insects in the Fort Simpson and Mackenzie River Delta areas in support of this identification work. The institute will also provide taxonomic support for the IBP projects on Cornwallis and Devon islands.

Plant Research Institute, Ottawa, Ontario

The Institute was again asked to participate in Field work in relation to the CCIBP/CT program (Panel 10) in western Mackenzie District. Seven sites which had been proposed for possible preservation were visited. Reports on these sites are in process of being written.

A representative of the institute participated in the 'Northern Roads Task Force'. It was set up by the Department of Indian Affairs and Northern Development and the Department of Public Works to examine current practices employed in the location, design, construction and maintenance of northern roads, to assess the effect of these

practices on the natural environment, and to recommend on improved techniques and systems for future use which will minimize environmental damage. During the period August 29 to Sept. 3, a sub-committee of the task force carried out a brief inspection trip covering the Ingraham Trail, the Yellowknife Highway between Yellowknife and Fort Providence, and the Mackenzie Highway from the Yellowknife Highway turnoff to Fort Simpson.

Five research papers on northern flora were published during the year.

Planning is under way for a 1972 field survey of microflora in the vicinity of Cape Henrietta Maria at the juncture of the Hudson and James bays. This survey is to be in co-operation with the Ontario Department of Lands and Forests.

Soil Research Institute, Ottawa, Ontario.

Members of our Edmonton Soil Survey Unit will be continuing pedologic studies in connection with the Mackenzie Pipeline Corridor. Besides the field survey and identification of the soils, they are developing a terrain sensitivity area for the region in co-operation with the geologists and forest ecologists. One scientist is devoting full time to the field and laboratory work associated with this project.

A second scientist also of the Alberta Unit, will spend three weeks on Devon Island in connection with the IBP Study of this site. His work will include site characterization, some limited survey work and the associated laboratory characterization of the soils for productivity and management purposes.

DEPARTMENT OF COMMUNICATIONS

Responsibilities

The Department of Communications was established to foster the orderly development and operation of communications for Canada in the domestic and international sphere. This includes:

the development and introduction of new communications systems; the extension of telecommunications systems and services which are in the best interest of Canada both short and long term; the protection of Canadian interests in international telecommunication systems, and the allocation of radio frequencies so as to permit the orderly development and growth of radio communications.

The north is an area to which the department is devoting particular attention by studying the need for telecommunications, by researching systems to meet those needs and by co-ordinating and regulating the systems used by the telecommunications common carriers.

Long-term Plans

The aim of the department is to have communications frontiers extended northward so as to eliminate regional disparities and to provide telecommunications services of the same calibre as those in southern Canada. There are economic and political, as well as operational advantages in systems having full national coverage, because they have potential for achieving social unity. The Department of Communications will co-ordinate communications planning for federal agencies requiring telecommunication services in the north. In consultation with provincial agencies, improved telecommunication services will be planned and constructed in the northern parts of the provinces. Emphasis will be given to the following:

Network Facilities Development

The objective for northern communications shall be to establish throughout the country basic services qualitatively defined as follows:

- Telephone communication of a quality normally available in urban communities, to provide:
  - 24 hours-a-day service,
  - demand access to virtually unlimited subscribers,
  - operation by the user without training or special procedures,
  - quality of performance which adequately stimulates direct person-to-person verbal contact.
- Radio broadcast service, with the technical capability of providing the appropriate mix of local and national network programming.
- TV service, to at least the level of ITU "Community Reception" if not "Individual Reception", i.e. the reception of transmissions from a broadcasting satellite by simple domestic installations possessing small antennae. This TV service would include regional services for educational and other purposes.

Social and Cultural Aims

The objectives will be:

- To apply communications technology generally to the special needs of remote and isolated communities with priority given to the needs of native peoples.
- To develop specific services for intra-community and intercommunity communications, education, health and welfare — including the development and adaptation of appropriate hardware.
- To develop within communities the technical capacity to produce such services as will further the cultural aspirations of native peoples.

Northern Development and Sovereignty

The proper exercise of sovereignty in the north requires telecommunications that are flexible in deployment and operation. Specifically:

- Able to provide on short notice basic communications services to anywhere in the north to standards similar to those available in the south
- Able to provide telephone and message service to mobile parties anywhere.
- Sufficiently flexible for rapid expansion of communications facilities at any existing or newly established location.

Implementation Strategy

- To assess alternatives in planning the national communications network which will provide the mechanism for a proper balance of terrestrial and space systems to meet the many needs of northern communications.
- To rationalize federal and Territorial, industrial, and private communications needs and systems in the interest of more cost-effective and co-ordinated networks.
- Selection by the federal government of northern areas or communities suitable for field experiments in telecommunications so as to learn more about the desirable features of operational systems.
- Preparation of detailed plans for extending the domestic satellite communications configuration; in essence, an up-dating of plans to meet the objectives of the white paper on Satellite Communications.

- Strengthening of consultation with provincial and Territorial authorities on their needs for educational and general telecommunications and broadcasting services for remote areas.

Review of 1971 Operations

The program for launching the Canadian Domestic Satellite System by Telesat Canada is on schedule. The ANIK satellite will be operational on 1 January 1973, and systems planning is proceeding to ensure that the telecommunications coverage in the north is as extensive as possible. It is intended to have two large stations for telecommunications and television services at Frobisher Bay and Resolute; and 24 stations for the reception of television in the north. Additionally, it is hoped to have operational in the summer of 1973 a number of small earth receiving stations for a thin route northern service to remote communities. Prime attention is being given to the use of relatively low-cost earth stations having the capacity to receive and transmit two telephone channels. The system design also takes into account the need to provide one radio program circuit to enable the northern network of the CBC to be extended to small communities inaccessible by terrestrial means.

The Department of Communications will sponsor the launching of an experimental communication technology satellite in 1975 which will be of special importance to the north. By using a satellite with a high effective radiated power it will be possible to communicate with very small stations in remote communities using telephone, radio, and television signals. While the smallest Telesat earth station will use antennas having diameters of 15 ft., the stations working into the new experimental satellite will use antenna diameters of three to eight feet. Antenna sizes of this order permit inexpensive transportable stations to be designed to serve the smallest communities with the full range of telecommunications services. The experimental satellite will have a lifetime of two years.

Two major studies were completed by consultants for the department on communication satellite systems for Canada in the 1980s. One study concerned user demand, system configuration and cost estimates for an operational SHF satellite system to replace the initial domestic satellite system when its lifetime expires. The other study investigated the feasibility of a UHF satellite system that would be designed to meet mobile and transportable telecommunication needs in the north.

A new technique which permits community involvement through the use of the telephone and a broadcast transmitter was demonstrated in Rankin Inlet in 1971. The technique, known as COMMINTERPHONE, involves a simple attachment to the standard telephone exchange which can bridge up to four calls. From this bridge the common output is fed to a CBC radio transmitter which broadcasts the four conversations in the AM band within a five-mile radius. The broadcast can be received by anybody with a domestic radio receiver. Any listener wishing to add his or her comments to the issue being discussed can dial a designated telephone number to go on the air. A social evaluation is being made to decide how useful Comminterphone is to northern communities as a new means of education and entertainment.

The DOC continued to provide financial support to CN Telecommunications to an amount of $220,000 for the operation of the Mackenzie River pipeline system in the Northwest Territories. Improvements in service were made at Hay River and Inuvik and to all intermediate communities between these centres during 1971. In the Eastern Arctic the Department of Communications, at a cost of about $100,000, continues to support the operation of a tropospheric scatter terminal to provide telecommunications services from Frobisher Bay to southern centres over the Polevault system.

Canadian National Telecommunications completed their installation and final testing of a $2 million radio relay and tropospheric scatter system between Whitehorse and Inuvik. This is a major project and responds to the pressing need for telephone-data service that developed due to intense oil exploration in the Mackenzie delta. The company has added new exchanges in Arctic Red River, NWT and Old Crow, Yukon. The telephone exchanges at Aklavik, Inuvik, and Yellowknife, NWT and in Dawson City, Porter Creek, Watson Lake and Whitehorse, Yukon were enlarged.

Bell Canada has changed the HF radio system in northern Quebec to permit stations at Fort George, Fort Rupert, Nouveau Comptoir, and Poste de la Baleine to home in on Alma, Quebec instead of Moosonee, Ontario. The channel capacity at the Alma base station was increased to permit four simultaneous transmissions on the system. New HF stations were installed in the communities of Clyde River and Grise Fiord, NWT. A modification was made to the main HF station at Frobisher Bay to permit the transmission of six simultaneous channels from this point to communities in the districts of Keewatin and Franklin. The HF station in Cape Dorset was improved.

Plans for 1972

During 1972 network planning and financial arrangements for the implementation of the satellite thin-route service in the north will be finalized. This will require close collaboration by the department, Telesat Canada, CBC, Bell Canada, CNT, and the Advisory Committee on Northern Development. Decisions will be made on those communities in the Northwest Territories that have first priority for improved point-to-point telephone services. Attention will be given also to the need for live television in the Yukon since most communities there already have access to high-quality telephone services.

The Department intends to open a new district office in the community of Fort Smith, Northwest Territories to establish a local presence in the north. A northern project office will be established in Ottawa to arrange for a number of experimental communication systems; e.g. community broadcasting stations, video tape units, and dedicated HF networks to be installed in selected communities in the Northwest Territories and northwestern Ontario. Pilot systems will be established on two principles: first, those who use them should control them; second, training – both technical and production – must be provided in step with the installation of the systems themselves. Support will also be given to a program of the Ryerson Institute of Technology to develop a low-cost FM broadcasting transmitter which, if it proves satisfactory, could be used in small remote communities. The department will continue to participate in the Comminterphone experimental system in Rankin Inlet. Plans for the social exploitation of the Anik and Communication Technology Satellite will be pursued for the express benefit of the north.

Bell Canada is proceeding with plans to establish about nine stations of the thin-route service in the districts of Keewatin and Franklin during 1973 and further additions are contemplated for 1974-75. New HF toll stations will be established at East Main, northern Quebec and Lake Harbour, NWT. Expanded exchange service will be provided in the communities of Coral Harbour, Ekimo Point, Igloolik, Pond Inlet, Southampton Island (NWT); Fermount (Quebec); Goose Bay (Labrador). Equipment will be added to

the base station at Goose Bay which serves points on the Labrador coast and the HF system at Nain will be rebuilt.

CN Telecommunications propose to enlarge their exchange facilities in the following communities in the Northwest Territories: Cambridge Bay, Fort Franklin, Fort Good Hope, Fort Liard, Fort McPherson, Fort Providence, Fort Resolution, Fort Simpson, Gjoa Haven, Inuvik, Norman Wells, Pelly Bay, Pine Point, Spence Bay and Wrigley. Exchange enlargements are also planned in the Yukon for the communities of Teslin and Whitehorse. It is proposed to establish VHF base stations for mobile services in the communities of Faro (Yukon), Fort Good Hope, Fort Simpson, Morrisey, and Snare, NWT, in 1972.

DEPARTMENT OF ENERGY, MINES AND RESOURCES

EARTH PHYSICS BRANCH

Seismology Division

Responsibilities

The Division of Seismology *inter alia* provides a seismological risk and engineering seismology service in northern Canada and studies both deep and shallow permafrost and the active layer. Research on the Arctic lithosphere is conducted by seismic experiments (often in co-operation with the Polar Continental Shelf Project) and by geothermal methods. To meet these objectives, networks of seismic observatories are deployed in northern Canada so as to take advantage of the low-noise terrain.

Long-term Plans

The seismological observatory will be maintained and kept technologically up-to-date. An on-line digital seismic detection processor will be introduced into the Yellowknife Array, and further expansions of the long-period system at Yellowknife is planned. There will be field research on microseismicity and tectonics in the Mackenzie Valley area.

Deep crustal seismic sounding experiments are planned in the Sverdrup Basin and in the Arctic Ocean Basin. Geothermal work and deep permafrost measurements will continue, utilizing abandoned exploration wells.

Studies of shallow permafrost and the active layer will continue in the general area of the Mackenzie Valley in association with engineering geology studies. A "cold laboratory" will be deployed in the field.

Review of 1971 Operations

First-order seismic observatories were operated at Alert, Mould Bay, Resolute, Frobisher, Inuvik, Yellowknife, Baker Lake, Churchill, Great Whale River and Schefferville. A short-period seismic array, a long-period tripartite array and a data collection laboratory were operated in Yellowknife. A regional seismic observatory was commissioned at Whitehorse, and a strong-motion accelerograph installed at Fort McPherson. The seismic network was maintained, and the seismic arrays modernized by overall conversion to radio-telemetry from wire-line operation.

Geothermal and deep permafrost measurements were made at several abandoned exploration holes in the Sverdrup Basin. In collaboration with the GSC, permafrost studies in the Mackenzie Valley were undertaken, continuous monitoring of the active layer implemented and the thermal properties of soils measured at in-situ temperatures.

Plans for 1972

The seismological observatory program will continue. An on-line digital detection processor will be installed at Yellowknife, either in 1972 or 1973. A microseismicity survey will be conducted in critical areas of seismicity west of the Mackenzie Valley.

Geothermal and deep permafrost research will continue in the Sverdrup Basin. Shallow permafrost studies in the Mackenzie Valley will continue in co-operation with the GSC, and a field laboratory will be instrumented and deployed.

Long-range refraction studies will be undertaken in the Sverdrup Basin in co-operation with a GSC-oil consortia experiment to outline its depth.

Results from these programs will continue to be published in scientific and technical journals and made available to the industry, public and scientific communities.

Gravity Investigations in Northern Canada

Responsibilities

The Gravity Division, Earth Physics Branch, is responsible for completing the regional gravity survey of the Canadian north. This work is performed in co-operation with the Polar Continental Shelf Project of the department. Precise observations of gravity provide basic data for the mineral exploration industry and for studies of the earth's crust and upper mantle; in addition, these observations provide data for studies in physical geodesy and supply a need of the Department of National Defence. The division is also responsible for maintaining gravity standards in Canada's north by establishing a first-order gravity network to serve as reference and control points for all other regional and detailed gravity surveys conducted in the north, and by maintaining a data bank of all gravity data available in the Canadian north.

Long-term Plans

The main objectives of the Gravity Divisions's program in the north are to map the gravity field at intervals of 15 km or less over the land and water (ice) covered regions of northern Canada, to maintain a first-order gravity network in northern Canada, to develop and improve methods of measuring gravity under unstable conditions such as in ice-covered regions, and to study long-and short-term vertical and horizontal movements of the Arctic sea ice. Gravity and other related data will continue to be used within the division for studies of the structure of the crust and upper mantle, isostasy and vertical movements of the crust, and physical geodesy. The Gravity Division is also an active participant in the Arctic Ice Dynamics Joint Experiment (AIDJEX), an international multi-disciplinary program of

scientific investigations to be carried out in the Arctic in the next few years.

Review of 1971 Operations

Publication of the new Primary Gravity Network of Canada has been delayed pending adoption of the International Gravity Standardization Network 1971 — a world gravity network — by the International Union of Geodesy and Geophysics. This delay will ensure that the new reference system for Canada will be consistent with world-wide standards.

During 1971 approximately 6,100 new gravity stations were observed in the Canadian north. A major gravity survey was completed in a large area of the District of Mackenzie and the District of Keewatin which included King William and Southampton islands and the southern part of Boothia Peninsula. A second survey was mounted to complete the gravity coverage of Banks Island, and a third survey was carried out on the sea ice of the Beaufort Sea. A major part of this survey was done in co-operation with hydrographers of the Polar Continental Shelf Project.

The Division's participation in AIDJEX calls for systematic measurements of ocean tilt in the Beaufort Sea in 1972. During 1971 instruments and equipment have been developed in the laboratory for this purpose, based on pilot studies previously carried out in the Arctic Ocean and the Gulf of St. Lawrence.

Plans for 1972

Plans for 1972 include the AIDJEX experiment previously mentioned and systematic gravity surveys of Victoria Island north of 70°N and of the Mackenzie Bay region.

Division of Geomagnetism

Responsibilities

The Division of Geomagnetism measures and charts the magnetic field of the earth, operates a network of magnetic observatories, and conducts research into the structure of the upper atmosphere and solid earth by geomagnetic methods.

Long-term Plans

To re-occupy magnetic repeat stations at three-to five-year intervals; to conduct three-component airborne magnetic surveys at five to 10 year intervals; to operate permanent and temporary magnetic observatories.

Review of 1971 Operations

Approximately 10 magnetic stations were re-occupied in the western NWT and Yukon, to determine the secular variation of the earth's magnetic field. Studies of the anomaly in geomagnetic induction on Ellesmere Island were extended to the north, with four temporary stations on the ice of the Lincoln Sea northeast of Alert. Preliminary analysis of the data indicates that the anomaly extends into the continental shelf. Extensive collections of rocks for paleomagnetic research were made in the Great Slave Lake and Great Bear Lake regions, and in the Melville Peninsula. Six magnetic observatories recorded the earth's field continuously through the year, at Alert, Mould Bay, Resolute, Baker Lake, Churchill, and Poste de la Baleine. The building for a new automatic magnetic observatory was completed at Cambridge Bay, but the station was not operational in 1971.

Plans for 1972

A 60,000 mile three-component airborne magnetic survey covering the Yukon and most of the Northwest Territories is planned for September-October 1972. Survey lines will be flown at 12,000 to 15,000 feet, 20 miles apart. Repeat stations will be re-occupied in Baffin Island, northern Quebec and Labrador. Further studies of the Ellesmere Island induction anomaly will be conducted from the sea ice in Robeson Channel and the Lincoln Sea. Paleomagnetic collections will be made in the Northwest Territories and Labrador.

GEOLOGICAL SURVEY OF CANADA

Responsibilities

The Geological Survey of Canada surveys, describes and interprets the geology of Canada and associated mineral deposits of economic interest. It maintains teams of experts in the earth sciences and supporting disciplines to carry out these tasks, to conduct related research and development and to provide geoscientific advice and support to federal agencies. It also provides geologically based information on land resources and terrain performance designed to assist in effective use and conservation of resources and in the management and preservation of man's environment throughout Canada.

Long-term Plans

The Geological Survey is designed to support the study of mineral and energy resources and earth surveys carried out by the Department of Energy, Mines and Resources. A principal sub-objective of the former is to determine the mineral and energy resources of Canada. An increased concern for the northern environment is reflected in the expansion of the Survey's activities in the field of terrain sciences.

It is expected that the reconnaissance phase of the national geological mapping service (mainly at scales of 1:250,000 and 1:500,000) will be completed by about 1976, if work continues at the present rate.

Collaborative projects designed to describe the geological history and structure of sedimentary basins, with a view to providing geological data and interpretation necessary to the assessment, exploration and exploitation of mineral resources, will be continued in the Interior Plains, Arctic Lowlands and Innuitian Regions.

The multi-discipline study of the Precambrian rocks of the Bear-Slave province will be continued as part of the national mapping service, and in support of mineral inventory and forecasting.

The need for an inventory of the unconsolidated deposits and landforms of the north will be met by reconnaissance mapping at scales of 1:1,000,000 or 1:500,000.

Aeromagnetic mapping coverage at the scale of one inch to one mile, to explore the geology at depth, below the overburden, is planned for completion by 1980 or earlier. This work is done by industry under contract.

Review of 1971 Operations

About 51 projects, including aeromagnetic surveys, were carried out north of 60° in 1971. Forty-four of these were in the Northwest Territories and seven in the Yukon Territory. Preliminary results were made available to the public 10 January 1972 in *Report of Activities, April to October, 1971* (Geol. Surv. Can. Paper 72-1, Pt. A).

Regional inventory mapping (1:250,000) was almost completed in the Aishihik Lake, Snag and Stewart River map-areas of Yukon Territory. Although no new mineral deposits were discovered the known copper deposits indicate that outcrops of a coarse-grained equigranular granite of Tertiary age are the best areas for searching for new deposits.

A regional sampling program by geochemists, begun in 1970 in the Eastern Yukon, was completed. Those preliminary results which were thought to be of immediate use in mineral exploration have been

released. The samples are now being analyzed in more detail and any results of possible economic significance will be made available throught the GSC Open File system.

Potential structural traps for migrating hydrocarbons were identified in 1962 during reconnaissance work in northern Yukon and western District of Mackenzie. In 1971 one of these, the White Mountains uplift, was studied in greater detail.

Several officers continued stratigraphic and paleontological studies of Mesozoic rocks in northern Yukon and northwestern District of Mackenzie.

Aeromagnetic surveys were continued in different parts of the north. About 51,500 square miles were mapped, and about half the resulting data will be compiled and printed by March 1972. Areas covered included parts of NTS map-sheets 13, 26, 37, 45, 65 and 66.

Experimental airborne gamme-ray spectrometry surveys were made between Ottawa and Yellowknife, from Yellowknife to Coppermine, in the Coppermine and Yellowknife areas, and between Yellowknife-Whitehorse-Dawson and Watson Lake. Preliminary results have been published in GSC Paper 72-1, Pt. A.

Experimental colour aerial photography was continued in the Yellowknife area and about 2300 line miles have been flown. Data will be placed on open file and the colour negative material will be deposited with the National Air Photo Library.

Continued emphasis was given to developing methods for using geochemical techniques in assessing the mineral potential of permafrost regions. A seven-page report (GSC Paper 72-1, Pt. A, pp. 62-68) gives preliminary results.

A feasibility study of geochemical sampling of Arctic coastal streams by helicopter from government icebreakers was made from the *John A. Macdonald*, and indicated that the method offers an effective and economical way of collecting data from the Arctic coastline when normal operations are very expensive.

Studies of granitic rocks in the Slave structural province were begun in parts of map-sheet 85/1, and the 1:250,000 inventory mapping of Yellowknife and Hearne Lake map-areas was continued. The stratigraphic and metallogenetic studies of the Kaminak Group were continued in the Rankin Inlet-Ennadai Belt, as was the investigation of the Daly Bay Complex north of Chesterfield Inlet.

Terrain performance studies were carried out on Melville Island to evaluate the effects of man's activities on a variety of terrain units. Detailed geological mapping of Tuktoyaktuk and environs was done, with particular attention given to locating aggregate materials.

The geological survey continued to take part in studies of the Mackenzie Valley transportation corridor, and in 1971 a geological reconnaissance was carried out and drilling techniques evolved for the recovery of frozen soil samples. Studies were made of the slopes and river bank erosion along sections of the Mackenzie River and its tributaries. Terrain sensitivity studies were also undertaken in the corridor to evaluate the response of various soil and rock materials to different types of natural and man-caused disturbances.

Quaternary deposits and geomorphology were mapped at the scale of 1:250,000 for map-sheets 85E, 95A, H, J and 96B (south). The areas were chosen by selecting the ones for which data would be most beneficial to those engaged in pipeline construction and related activity.

As part of the inventory mapping of surficial materials, studies were undertaken on Melville Island and in the Archer Fiord-Lady Franklin Bay area of northeastern Ellesmere Island.

During August and September 1971 the survey participated, with Aquitaine Company of Canada Ltd., in a marine geological study of Hudson Bay. The submersible *Pisces III* was used. Paleozoic bedrock was studied as part of the GSC basin analysis for the evaluation of petroleum and natural gas resources, and the quaternary sediments were examined to provide information related to potential foundation problems of offshore structures, and to extend our knowledge of modern sedimentary processes.

The quaternary geology of the Arctic coastal plain was studied in detail near Eskimo Lakes and the east half of the Aklavik sheet.

Seismic reflection work, begun in 1970 and continued in 1971, has enabled GSC scientists to work out the origin and structure of the Mackenzie Canyon. These results are valuable in understanding the nature and development of the northern continental shelf.

Because large areas of northern Canada are covered by a mantle of glacial drift which obscures the bedrock, prospecting is often difficult. The Survey has carried out studies for tracing mineral deposits by sampling drift, and in 1971 continued to do so in the Kaminak Lake area, District of Keewatin. An analysis of the results of this work and a correlation between the results and the published bedrock maps of the area will be made in 1972.

Stratigraphic and paleontological studies of post-Precambrian rocks were carried out in various parts of the north. The cretaceous and tertiary rocks of Ellef Ringnes Island and nearby smaller islands were examined as part of a study of the Sverdup Basin designed to determine the significance of structure and stratigraphy on the genesis and accumulation of hydrocarbons in the area.

Operation Grinnell, a study of southwest Ellesmere and western Devon Island, was continued. Like the work on Ellef Ringnes Island, the primary purpose of this study is to help evaluate the resource potential (especially petroleum) of this part of the north.

Diapiric structures (piercement domes) are characteristic of the Arctic Islands petroleum region, and a study of such structures in the Bauman Fiord Formation on central Ellesmere Island is designed to investigate the structures.

Studies of the upper Paleozoic – lower Mesozoic rocks of southern Ellesmere Island were carried out by several officers. One study disclosed the presence of Lower Permian carbonate "hydrozoan" mounds. Such structures are of considerable interest in searching for hydrocarbons. A fuller description will be found in GSC Paper 72-1, Pt. A, p. 219-221.

The survey has published numerous guidebooks with detailed descriptions of mineral localities accessible to the amateur "rock-hound". These cover most provinces. In 1971 a number of survey staff members examined sites in British Columbia and the Yukon that are accessible from the Alaska Highway.

Appendix A lists items published by the Geological Survey in 1971 dealing with the north.

Plans for 1972

The Bear-Slave geological province of the District of Mackenzie is relatively accessible, and its geology is similar to that of other productive areas of the Canadian Shield, one of the world's richest mineral areas. A multidisciplinary study of this region, begun in 1971, will continue in 1972. Included in the activities will be a geochemical reconnaissance designed to sample lake waters and lake muds in a 40,000 square mile area. Bedrock mapping of several map areas at a scale of 1:250,000 will be continued and/or

begun in order to update existing reconnaissance maps.

In central Keewatin new mapping and the updating of existing maps will also be carried out. The regional geological setting of known mineral deposits will be studied to assess the overall mineral potential of the area.

In order to understand the regional and structural geology of the Sverdrup Basin seismic surveys will be made with the participation of industry.

Aeromagnetic surveys will be continued. More than 860,000 has been budgeted for such work in various parts of the Northwest Territories. All of these activities are carried out under long-term contracts.

Studies in connection with the Mackenzie Valley Corridor will be continued. These are designed to map, describe and explain the surface and near surface earth and rock materials, landform features, ground ice, permafrost and muskeg. Such data are essential to government and industry in planning, regulating, building and operating pipelines. Data resulting from the 1971 field season will be made available in preliminary form as soon as they are compiled.

The increasing use of the Arctic emphasizes the need for accurate data on terrain performance, and such studies will be continued in 1972 with some financial support from IAND. Atlas-type terrain maps are being released in preliminary form as soon as they are prepared.

Basin analyses will be carried out in areas of sedimentary rock in various parts of the Interior Plains and Arctic Lowlands. Such studies are of direct assistance to those engaged in exploration, planning, administration and regulation of petroleum and natural gas resources.

APPENDIX A

The following are geological survey reports issued in 1971, dealing with the Northwest Territories and Yukon Territory. Many of them are accompanied by maps, which are not listed separately.

Memoirs

Memoir 365 Geology of Beechey Lake map-areas, District of Mackenzie – A part of the Western Canadian Precambrian Shield (76G), by L. P. Tremblay.

Bulletins

Bulletin 180 Stratigraphy and structure of the "Keno Hill Quartzite" in Tombstone River – Upper Klondike River map-areas, Yukon Territory, by D. J. Tempelman-Kluit.

Bulletin 192 Contributions to Canadian Paleontology, by A. E. H. Pedder, A. C. Lenz, D. E. Jackson, A. R. Ormiston, W. W. Nassichuk, T. P. Chamney.

Bulletin 197 Contributions to Canadian Paleontology, by B. S. Norford, A. E. H. Pedder, Allen R. Ormiston, Jerome A. Eyer, W. M. Nassichuk, Claude Spinosa, Charles A. Ross, William S. Hopkins, Jr.

Bulletin 200 Part I – Biostratigraphy of some Early Middle Silurian ostracoda, eastern Canada. Part II – Additional Silurian arthropoda from Arctic and eastern Canada, by M. J. Copeland.

Bulletin 201 Archacocyatha from the Mackenzie and Cassiar Mountains, Northwest Territories, Yukon Territory and British Columbia, by Robert C. Handfield.

Papers

Paper 69–44 The geochemistry of Coppermine River basalts, by W. R. A. Baragar (with a contribution by R. N. Annells).

Paper 70–12 Geology, Colville Lake map-area and part of Coppermine map-area, Northwest Territories, by D. G. Cook and J. D. Aitken.

Paper 70–13 Lower and Middle Devonian stromatoporoids from northwestern Canada, by C. W. Stearn and P. N. Mehrotra.

Paper 70–17 Metallic mineral industry, District of Mackenzie, Northwest Territories, by J. C. McGlynn.

Paper 70–22 Marine Cretaceous Biotic and Paleogeography of Western and Arctic Canada. Illustrated by a detailed study of ammonites, by J. A. Jeletzky.

Paper 70–27 Eskimo Point and Dawson Inlet map-areas (north halves), District of Keewatin (55 E and 55 F north parts), by A. Davidson.

Paper 70–30 Tertiary and Cretaceous biostratigraphic divisions in the Reindeer D–27 Borehole, Mackenzie River Delta, by T. P. Chamney.

Paper 70–32 Brock River map-area, District of Mackenzie (97D), by H. R. Balkwill and C. J. Yorath.

Paper 70–45 Geology of Ennadai Lake map-area, District of Keewatin, by K. E. Eade.

Paper 70–47 Geological exploration in the Coppermine River area, Northwest Territories, 1966-1968, by R. I. Thorpe.

Paper 70–61 Geology of Henik Lakes (E 1/2) and Ferguson Lake (E 1/2) map-areas, District of Keewatin, by R. T. Bell (with a contribution by J. L. Talbot).

Maps

Map 1281A Geology, Nonacho Lake, District of Mackenzie, compiled by F. C. Taylor.

Map 1311A Greely Fiord West (Geology), District of Franklin, by R. Thorsteinsson, 1971.

Map 1381A Oil and Gas Pools of Western Canada: Southern Saskatchewan and Southwestern Manitoba with Yukon Territory and part of Northwest Territories.

Open file

Open file 46 Chemical results of heavy mineral concentrates from stream sediments in Keno Hill, Yukon Territory.

Open file 48 Preliminary drafts of two surficial geology maps of Mackenzie Districts, by R. W. Klassen, covering NTS 97, C. D.

Open file 58 Side Scan Sonar, Echo Sounding and Shallow Seismic Data, Beaufort Sea.

Open file 59 Preliminary drafts of 16 surficial geology maps, and a legend (7p.) of part of southern Labrador (13G) by R. J. Fulton, D. Hodgson and C. Minning.

Open file 60 The under-way-geophysical data obtained by CSS *Hudson* in Beaufort Sea in August and September 1970.

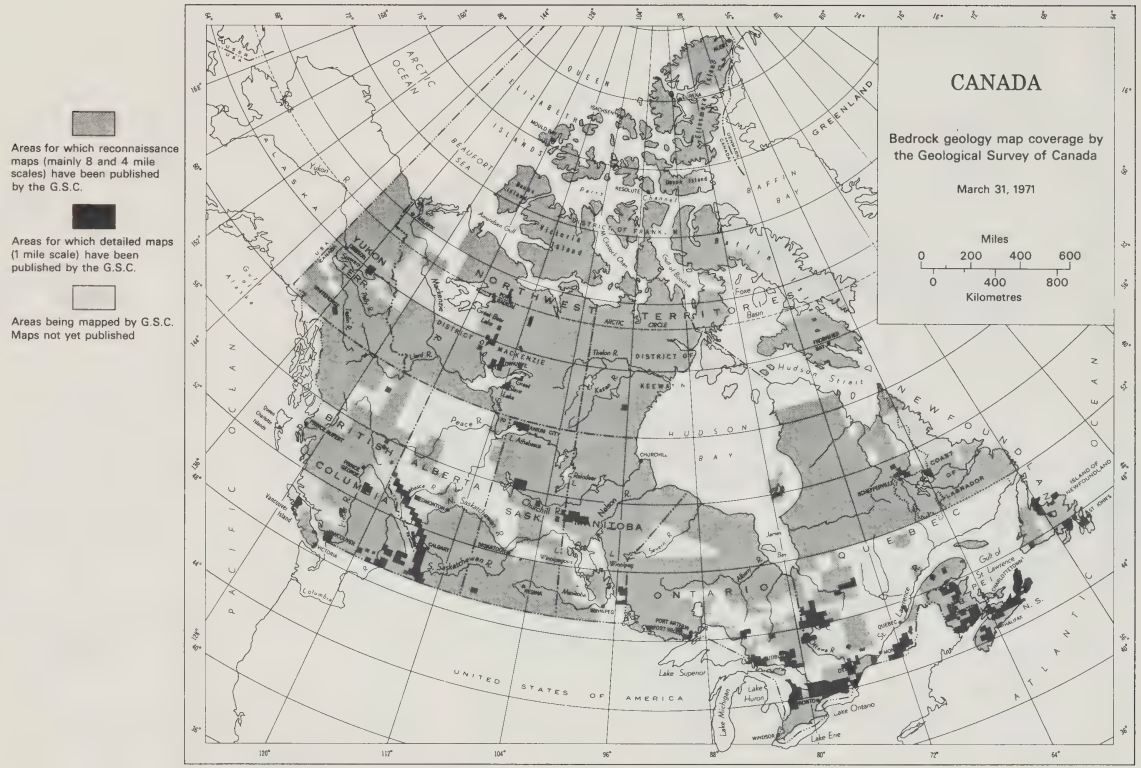
Open file 64 Preliminary notes on lower Paleozoic geology, Foxe Basin, northeastern Melville Peninsula, and part of northern and central Baffin Island by H. P. Trettin.

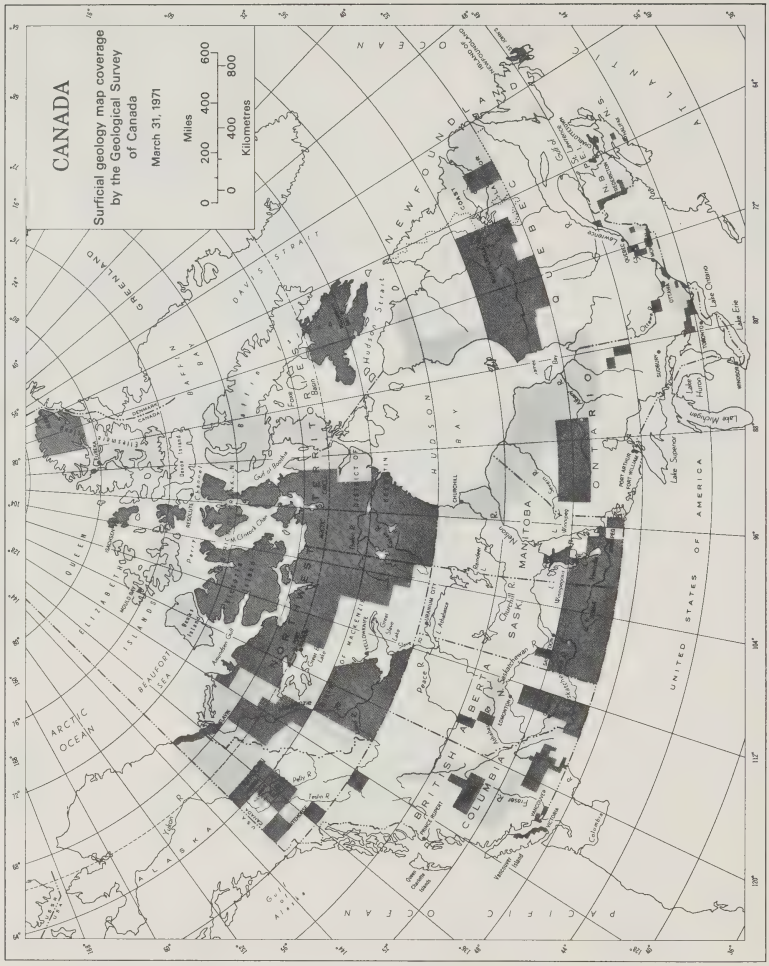
Open file 65 Upper Paleozoic stratigraphy of the Egale Plain Basin, Yukon Territory, by H. L. Martin.

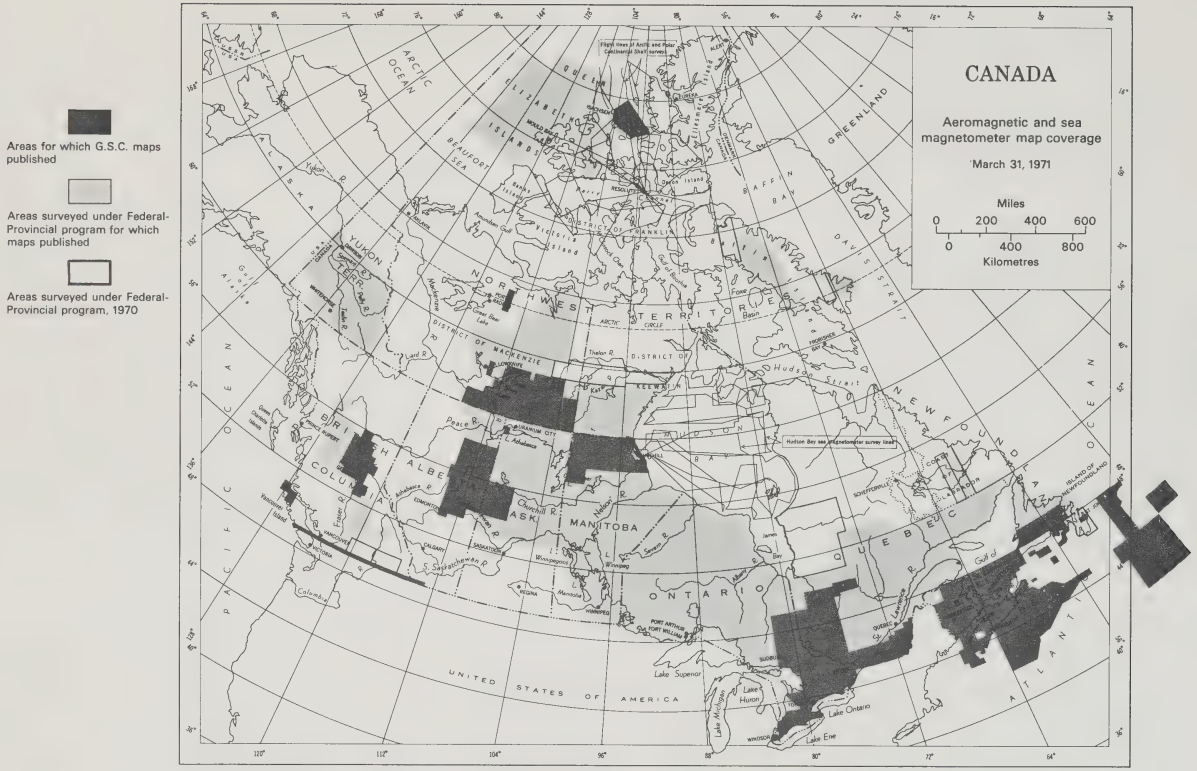
Open file 66 Geology of Prince of Wales and adjacent small islands, District of Franklin, by R. L. Christie.

Open file 67 Carboniferous and Permian stratigraphy of Axel Heiberg Island and western Ellesmere Island, Canadian Arctic Archipelago, by R. Thorsteinsson.

Open file 78 Preliminary drafts of 16 surficial geology photomosaic maps, and a legend (7p.), of part of southern Labrador (13D) by R. J. Fulton, D. Hodgson and G. Minning.


CANADA
Bedrock geology map coverage by the Geological Survey of Canada
March 31, 1971
Miles
0 200 400 600
0 400 800
Kilometres
Areas for which reconnaissance maps (mainly 8 and 4 mile scales) have been published by the G.S.C.
Areas for which detailed maps (1 mile scale) have been published by the G.S.C.
Areas being mapped by G.S.C. Maps not yet published
ARCTIC OCEAN
BEAUFORT SEA
QUEEN ELIZABETH ISLANDS
GREENLAND
BAFFIN BAY
ALASKA
YUKON TERR.
NORTHWEST TERRITORIES
DISTRICT OF MACKENZIE
DISTRICT OF KEEWATIN
HUDSON BAY
BRITISH COLUMBIA
ALBERTA
SASK.
MANITOBA
ONTARIO
QUEBEC
NEWFOUNDLAND
LABRADOR
PACIFIC OCEAN
ATLANTIC OCEAN
UNITED STATES OF AMERICA
Lake Superior
Lake Michigan
Lake Huron
Lake Ontario
Lake Erie
Gulf of St. Lawrence
ISLAND OF NEWFOUNDLAND
N.S.


CANADA
Surficial geology map coverage by the Geological Survey of Canada
March 31, 1971
Miles
0 200 400 600
Kilometres
0 400 800
Areas for which G.S.C. maps published since 1900
Areas being mapped by G.S.C. Maps not yet published


CANADA
Aeromagnetic and sea magnetometer map coverage
March 31, 1971
Miles
0 200 400 600
0 400 800
Kilometres
Areas for which G.S.C. maps published
Areas surveyed under Federal-Provincial program for which maps published
Areas surveyed under Federal-Provincial program, 1970
ARCTIC OCEAN
PACIFIC OCEAN
ATLANTIC OCEAN
GREENLAND
ALASKA
YUKON TERRITORY
NORTHWEST TERRITORIES
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
QUEBEC
NEWFOUNDLAND
UNITED STATES OF AMERICA
Lake Superior
Lake Huron
Lake Ontario
Lake Erie

THE MINERAL RESOURCES BRANCH

Responsibilities

The Mineral Resources Branch is responsible for resource-economic research, program development and policy formulation in the field of non-renewable resources on a commodity and industry basis and in a regional, national and international context. The aim is to realize optimum economic and social benefits for Canada through effective mineral resource management in keeping with departmental objectives. Branch interests include mineral resource and economic development in northern Canada. The branch collaborates with the Department of Indian Affairs and Northern Development and other departments and agencies and participates in policy formulation, program planning and project evaluation carried out by the department. The branch administers the Emergency Gold Mining Assistance Act and advises and recommends on mineral taxation matters to the Department of Finance and the Department of National Revenue.

Long-term Plans

The branch will continue to advise on, participate in, and undertake programs and activities that are related, wholly or in part, to mineral exploration, development, exploitation and utilization, and northern economic development.

Review of 1971 Operations

The Mineral Resources Branch continued to advise the Department of Indian Affairs and Northern Development and to participate in interdepartmental activities concerned with northern economic development. A special study was made of northern development policy and comments and suggestions were forwarded to Indian Affairs and Northern Development.

As a member of the Interdepartmental Advisory Committee on Northern Development, the Interdepartmental Advisory Committee on Northern Roads, the Interdepartmental Committee on Pacific Coast Transportation, and the Administrative Group on Northern Roads and Airstrips, the branch was involved in various economic mineral assessments. Many of these appraisals were related to the 10-year, $100 million northern roads program which was implemented in 1965.

At the request of the Department of Transport, consideration was given to providing financial support for a proposed feasibility study by private interests on a railway which would carry northern oil to markets. A general assessment of the mineral potential along the proposed route of the railway was made for the study group.

The branch, through the deputy minister, assisted the organizers and planners of the Sixth National Northern Development Conference, scheduled to be held in Edmonton in late 1973.

The Branch is a member of the Intergovernmental Committee on Northern Development of the Canadian Council of Resource and Environmental Ministers. The committee will continue to study ways in which contributions to the development of Canada's north can be made. It is planning to be represented at the Council's 1973 Conference on Man and Resources with a view to producing a philosophy for northern development.

The department's responsibility for national energy policies requires special attention to petroleum and natural gas developments in the Arctic and involves the branch in departmental and interdepartmental task forces.

The branch administers the Emergency Gold Mining Assistance Act, introduced in 1948 to provide financial assistance to marginal gold mines. Current extension of the Act expires 30 June 1973. In 1971 field inspections were made of placer-gold and lode-gold operations in the northern territories. Approximately $1,700,000 was payable to five lode-gold mines in the Northwest Territories and $12,000 to 10 placer-operators in the Yukon.

The branch provides technical advice and recommendations to the Department of National Revenue on taxation matters relating to the mineral industry (three-year tax exemption, depreciation, depletion, etc.) under the Income Tax Act. Field investigations are made for this purpose. During 1971 consideration was given to 28 tax submissions and 20 were dealt with. Five were regarded as northern operations although only one was in the Territories.

A further study was made of the proposed Yukon Minerals Act, and consideration given to the new Territorial Land Use Regulations which came into force in late 1971. On behalf of the Department of Finance the branch studied the provisions contained in the Income Tax Reform Act relating to the mineral industry, and the effects the new legislation would have on mineral operations in the Territories.

The resource potential evaluation section of the branch began monitoring mineral industry developments in the north so as to provide information to senior departmental personnel who participate in interdepartmental activities in the north. One such study was on the costs of developing mineral deposits in the north.

Updating of the Yukon and Northwest Territories sections of the National Mineral Inventory was completed. Assessment records filed with the Department of Indian Affairs and Northern Development to the end of 1971, along with other sources, were researched for data on mineral occurrence. This information has been incorporated into the inventory and the results made available to the Northern Economic Development Branch in Ottawa and to the resident geologists at Yellowknife and Whitehorse.

Plans for 1972

As a participant in related interdepartmental committees and task forces, as administrators of the Emergency Gold Mining Assistance Act and as advisor to such other departments as Indian Affairs and Northern Development, National Revenue, Finance and the Ministry of Transport, the Mineral Resources Branch will continue its mineral economic studies and will make policy recommendations on northern economic development.

The Branch will carry out or participate in special studies on national mineral and national energy policies, both of which affect the north, and on transportation problems along the Mackenzie Valley and in the Arctic. Assistance will continue to be provided to the organizers of the Sixth National Northern Development Conference and the Conference on Man and Resources, both of which will have significance for northern development.

Officers of the branch will continue to participate in seminars and conferences concerned with northern mineral economics and development and also carry out necessary northern field investigations and inspections.

MINES BRANCH

Responsibilities

Technical assistance for the development of mining and metallurgical industries in the north and for the development and utilization of petroleum and natural gas resources. Consultant advice and investigations on metals, metallic and non-metallic minerals, fuels, petroleum, and natural gas as related to northern development.

Long-term Plans

To continue technical assistance in developing mineral, petroleum, and natural gas resources in co-operation with industry, the Department of Indian Affairs and Northern Development, and other branches of government.

Review of 1971 Operations

Extraction Metallurgy

Several research and development programs carried out in extraction metallurgy will be of benefit to the mining industry of the Northwest Territories and the Yukon. These programs included the recovery of trace metals from plant effluent by ion exchange for control of pollution and, in some cases, the recovery of economic amounts of metal. Two chemical processes were developed for preventing the formation of arsine in the cyanidation of arsenical gold ores, a facility which could possibly be used to eliminate the poisonous gas in a mill.

In ore treatment, studies were made of corrosion attack on the grinding media and on flotation circuit equipment. The results of these tests could effect a substantial cost reduction in the production of mineral concentrates. Computor applications were developed for estimating grinding circuit parameters, essential in preparing mathematical models for predicting grinding and classifying circuit operations.

In analytical chemistry, procedures continued to be developed for improving instrumental analysis of ores and products for yielding more convenient and speedier determinations. The Canadian Mineral Analysts, an organization which holds annual meetings and disseminates information to delegates, will publish its *New Methods Manual for the Canadian Mining Industry* this year. Mining companies in the NWT and the Yukon contributed several analytical methods to this volume.

As in past years, the Mines Branch hosted the annual meeting of the Canadian Mineral Processors where operating staff from the base metal and gold mining industry, together with Mines Branch scientists, exchange technical ideas and hear formal presentations on such topics as mine drainage, process control and equipment maintenance.

Mineral Sciences

The following analytical work was performed for the engineers and scientists of the Mines Branch on projects relating to the Yukon and Northwest Territories:

- Arctic Gold Mines – 31 determinations for nickel, iron and sulphur were performed on 18 samples.
- Ferrous Section, Physical Metallurgy Division –
  - Six determinations for copper, nickel and chromium were made on two samples of corrosion products.
  - Thirteen determinations were conducted for carbon, manganese, silicon, sulphur, phosphorous, chromium, copper, nitrogen, nickel and total aluminum on a sample of Stelco Romming Steel Billet.

Fuels Research

Investigations conducted by the Fuels Research Centre consisted of analysing one air sample from Giant Yellowknife mine as part of the study to increase the safety of mining in Canada.

Research on highly metamorphosed coal samples from the Mount Bush area were completed to assist Norman H. Ursel Associates Limited in securing a better understanding of the geology and geothermal gradients in the area as an aid to the search for coking coal. The petrographic analysis showed this coal to be extremely high in rank, approaching graphite. It also contained a high proportion of mineral matter. The high rank was confirmed by the proximate analysis, and Ursel Associates are in contact with Professor Inculet at University of Western Ontario to test the feasibility of separating a graphite concentrate electrostatically.

Physical Metallurgy

Mines Branch work on development of the north has been co-ordinated in two major projects: one covering metals and alloys for use in the Arctic generally, and the other dealing specifically with pipelines for Canada's oil and gas deposits in the north.

Metals and Alloys for Use in the Arctic

A critical survey of technical literature was carried out to determine the strength characteristics of ferrous and non-ferrous engineering alloys at temperatures down to -100°F. Information was also obtained on their present and potential application in the north, and the problems associated with their use in engineering structures and components. Preliminary data sheets were prepared and steps taken to fill the more significant gaps in knowledge. The ultimate objective is a monograph to provide guidance and technical data for the design of structures, vehicles and equipment for the north. At the same time it should be of service to construction and maintenance engineers and should facilitate economical and efficient development.

The study of the effects of forming has continued, with particular reference to the degree of strain ageing, as evidenced by deterioration in the toughness properties at low temperatures. Selected high-strength, low-alloy steels are being examined, and normalized samples have shown a marked difference in behaviour, depending on the ageing history. The work has been extended to cover two low-alloy steels in the quenched and tempered condition, one being sensitive to temper embrittlement and the other insensitive.

Basic research on the detrimental effect of small amounts of titanium in certain steels has revealed that the principal cause of embrittlement is the formation of cracks around complex titanium sulphides at the prior austenite grain boundaries. High-heat treatment was observed to improve the toughness characteristics. Work is in progress on the influence of rare-earth additives in improving the transverse and short-transverse ductility of structural steels, using different deoxidation practices.

Low-maintenance steel structures have obvious practical advantages in northern regions, and two methods of achieving this are under investigation, one being the use of weathering steels and the other the application of the galvanizing process. Weathering steels are low-alloy steels that develop a corrosion-resistant patina, in the formation of which phosphorus plays an important role. Further impact tests have been carried out to confirm the level to which the phosphorus content can be raised without deleterious effects, and long-term corrosion tests and accelerated dip-and-dry corrosion tests are being done to evaluate the weathering properties. The study of the effect of galvanizing was extended to cold-worked structural steels. No stress corrosion cracking was observed during pickling. The various types of embrittlement normally associated with galvanizing have been analyzed and a report prepared showing how they can be recongized and overcome by selection and processing.

The effective use of high-strength steels in the north is dependent upon a thorough understanding of the principles and application of fracture mechanics. It has been shown that the general level of the elastic strain field plays a dominant role in constrained plastic flow at a crack tip, and that the stress for loss of constraint can be computed from a complete elastic solution. The limitations of fracture appearance as an indication of ductility have also been demonstrated.

In related work on high-strength alloys, the effect of the environment on the rate of sub-critical crack growth has been examined. The studies have been carried out in a simulated marine environment on a variety of parent metals and weldments, both with and without some degree of cathodic protection. Their relative resistance to environmental cracking has been determined and the superior alloys are being studied more thoroughly.

Metals and Alloys for Fuel Transmission Pipelines

The effects of chemical composition, heat treatment and thermo-mechanical processing on the toughness and yield strength of low-carbon and low-alloy structural steels are being investigated. Earlier work on carbon-manganese steel plate defined the controlled rolling conditions required to produce the optimum combination of properties. It has now been shown that improved strength characteristics can also be obtained with slab material of a large initial grain size by careful selection of the processing conditions. The incorporation of these findings into a potential industrial rolling schedule is in progress.

The development of structural steels adapted to direct quenching on the run-out of the hot mill followed by tempering is also under way. The objective is improved line-pipe material and two types of steel are being studied – a low-carbon steel with a yield strength of 65-80 kpsi, and a low-alloy steel with a yield strength of 90-100 kpsi. A special ingot mould was designed and proved satisfactory for laboratory use, and direct-quenching facilities are being installed.

A method for the unambiguous determination of the dynamic fracture toughness of the type of structural steels that will be used for the northern gas and oil transmission pipelines is being critically evaluated. The method involves drop-weight tests on an instrumented pre-cracked bar, and the dynamic toughness data derived have shown substantial agreement with those obtained earlier from a series of notch tension tests in which the notches had an embrittled layer at their tip. Measurements are continuing over a range of plate thicknesses, geometries and temperatures with the objective of delineating the limiting test parameters of the new method.

The possibility that low-cycle fatigue may play a significant part in triggering failures in pipelines, as well as in other engineering structures, particularly at low temperatures, has led to the initiation of research into the low-cycle fatigue of structural steels. The initial aim is to determine whether low-cycle fatigue can induce low-stress failures when the steel is brittle under dynamic loading and, if so, what are the necessary conditions. A longer-term objective is to study low-cycle fatigue behaviour as a function of the metallurgical variables which influence "shelf energy" in pipeline steels. Several large plate specimens have been fatigued at temperatures in the transition range and the preliminary results are being assessed.

Welding on line pipe for use in the north is being studied in terms of the weldability of the parent material and the metallurgical characteristics of the commercial weldment. The weldability of an experimental age-hardening steel has been assessed, using various electrodes, by means of the controlled-thermal-severity (CTS) fillet weld test and the Tekken butt weld test. Weld cracking was encountered even when welding at room temperature, and would be expected to be more serious at low ambient temperatures. The longitudinal seam weld in fabricated pipe was found to have notch ductility inferior to that of the base metal. Laboratory work indicates that the Tekken test is more severe than the CTS test, and may be more appropriate for evaluating the field welding of pipelines.

In view of the possibility of some corrosive content in the pipeline, e.g., sour gas, or of the fortuitous exposure of surface areas of the installed line, the environmental cracking susceptibility of candidate materials is considered to be of some importance. Work in progress on three high-strength structural steels has shown little or no effect on crack propagation for specimens freely corroding in salt solution, but has shown indications of susceptibility to hydrogen embrittlement cracking when cathodically polarized.

In addition to the foregoing, advice and consultation has been provided to the National Energy Board, industrial organizations and various standardization committees.

Plans for 1972

Research will continue on the two major projects presented above. For the Arctic project on metals and alloys, research will be done on the toughness, fatigue, crack propagation and corrosion characteristics of certain ferrous and non-ferrous alloys in order to provide information for preparation of the monograph. In addition, a study of the effects of low-temperature exposure on the properties of titamium alloys is planned. For the pipeline project, efforts will be concentrated on evaluating the properties of Canadian and off-shore line pipe considered to be candidate material for the northern sections of the line. The development of improved steels for line-pipe production will proceed concurrently.

POLAR CONTINENTAL SHELF PROJECT

Responsibilities

To carry out a long-term study of the continental shelf lying north of the mainland of Canada and north and west of the Canadian Arctic archipelago, including the sea floor and the earth's crust and mantle beneath it, and the waters above it; together with the islands of the archipelago, the straits and sounds between the islands, and the adjacent mainland where relevant. The studies cover mainly those fields of survey and research for which the Department of Energy, Mines and Resources is responsible in other parts of Canada, wherever such study is not more economically and efficiently pursued as a separate self-contained operation; but it is also designed to include or to support worthwhile research in fields outside the domain of the Department if such research is in the national interest and could not otherwise be carried out. An important function of the Project is to co-ordinate and to arrange for mutual or concerted action by various agencies whose diverse specialties or capabilities can be brought to bear on different but related aspects of a major Arctic problem or critical area of study; and to provide continuity of planning and operation for various studies whose separate activities are short-term and focussed on individual problems. Emphasis is placed on field research and

survey, but basic laboratory or theoretical research is carried out as needed to aid in the investigations, or in the interpretation of field data; and equipment or technique development or experimentation is undertaken as relevant. In addition, the field facilities of the Project are made available, under certain conditions, to approved university and other non-government research groups.

Long-term Plans

The field survey and research activities will eventually cover all the Canadian sector of the Arctic continental shelf of North America, those parts of the Arctic Ocean basin that are of interest to Canada, and those parts of the Arctic archipelago and Arctic mainland not studied by other agencies in the fields of interest to the Department of Energy, Mines and Resources. It is intended that the co-ordinating and logistics support functions of the Project shall be made available, where appropriate and approved, to scientific activities of interest to the government of Canada in any part of Arctic Canada or the adjacent oceans.

Review of 1970 Operations

Major field activities were carried out from mid-February to early October and were co-ordinated mainly from Tuktoyaktuk on Kugmallit Bay in the Mackenzie River delta area and from Resolute on Cornwallis Island. A smaller study of sea ice was made in January, February and December.

About half of the investigations were undertaken in the Mackenzie River delta — Beaufort Sea area. The most comprehensive and concentrated activity was at the offshore camp ("Camp 200") in the eastern Beaufort Sea about 300 kilometers north of Tuktoyaktuk. The Arctic Ice Dynamics Joint Experiment (AIDJEX) 1971 Pilot Study, which encompassed some 20 research investigations involving 55 field personnel, as well as the offshore hydrographic and regional gravity surveys, were run from this camp on a drifting ice floe and serviced by Bristol Freighter and other aircraft, plus helicopters. Other studies ranged from the Richardson Mountains in northern Yukon to James Bay to Baffin Island to Lincoln Sea northeast of Ellesmere Island.

In addition to the Department of Energy, Mines and Resources, the following agencies were involved in or received assistance from the 1971 program of the Polar Continental Shelf Project:

Department of Agriculture
Department of the Environment
Department of Indian Affairs and Northern Development
Department of National Defence
National Museums of Canada
National Research Council — Canadian Committee for the International Biological Program
Department of Public Works
Quebec Department of Tourism, Fish and Game
AIDJEX Steering Committee (Canada and USA)
Arctic Institute of North America
University of British Columbia
University of Calgary
McGill University
McMaster University
University of Ottawa
University of Colorado, Institute of Arctic and Alpine Studies
U.S. Army Cold Regions Research and Engineering Laboratory
U.S. National Science Foundation

The following is a summary of work done in 1971 by the Polar Continental Shelf Project, or to which the Project contributed, in the major scientific fields. In several cases, as noted, the Project provided logistics or field support to studies of other agencies; these studies are described in more detail in the reports by the agencies responsible for their scientific direction.

- *Biology, entomology: chironomids:* Mackenzie River delta area

  Investigator: D.R. Oliver, Department of Agriculture

  A survey was made of the distribution and development of *Chironomidae* in the area of Tuktoyaktuk, Herschel and Hooper Islands, and Atkinson Point. Field support was supplied by the Polar Continental Shelf Project. Approximately 125 species of adult were collected, of which approximately one-quarter were associated with their inmature stages. Ecological data were obtained on many of these species, allowing studies of the influence of environment on morphology and development.

- *Biology, entomology: general insect* survey, Mackenzie River delta area

  Investigators: W.R.M. Mason (Hemiptera), D.M. Wood (Diptera), Department of Agriculture

  Comparative regional surveys were made of the general insect fauna on Tuktoyaktuk Peninsula and Eskimo Lakes area (east of Mackenzie River delta) and of the Herschel Island area (west of Mackenzie River delta) to determine the effectiveness of the delta as a barrier to dispersal of Arctic insect species. Field support was provided by the Polar Continental Shelf Project. Preliminary results show an unexpected variety of insect species west of the delta.

- *Biology, ethology: animal community study*, Bathurst Island

  Principal investigator: S.D. Macdonald, National Museum of Natural Sciences

  A long-term multi-discipline study of the fauna of the central Arctic archipelago and their interactions and relation to food supply and physical environment has been continued from the biological station established and supported by the Polar Continental Shelf Project on central Bathurst Island. Scientific direction and research support is provided by the National Museum of Natural Sciences and the Canadian Wildlife Service, with participation by Canadian and American universities. Principal studies in 1971 covered lemming, wolf, arctic fox, muskoxen, ptarmigan and breeding shore birds.

- *Biology, International Biological Program: Tundra ecosystem study,* Truelove Lowland, Devon Island

  Principal investigator: L.C. Bliss, University of Alberta for Canadian Committee for the IBP (NRC)
  Chairman of Canadian Committee for the IBP Tundra PT program: J.C. Ritchie, University of Toronto

  The Polar Continental Shelf Project contributed logistic support and provided special aerial photography to a major study of a high-Arctic ecosystem. The 1971 program involved researchers from 12 universities and government agencies under the general direction of the Canadian Committee for the International Biological Program (National Research Council), and comprised 22 separate study projects dealing with permafrost, terrain development, soils, meteorology, plant physiology, plant and animal production, decomposition, and systems analysis. Emphasis was on determining the flow of energy through the biological system, and on effect of man-made or accidental disturbances to the physical or biological environment.

- *Biology, marine botany: sea ice flora*, Ellesmere Island
  Investigator: S. Appolonio, private research (on leave from State of Maine Fisheries Research Station)

The Polar Continental Shelf Project provided partial field support to a survey of the cryo-flora under sea ice along the south, west and north coasts of Ellesmere Island. Additional support was provided by the Massey-Ferguson Company, National Geographical Society, Arctic Institute of North America, (U.S.) Office of Naval Research, University of Massachusetts, and the Fisheries Research Board of Canada. A sledge trip was made from Grise Fiord along the west side of Ellesmere Island to Ward Hunt Island to study the composition, variations and distribution of the microscopic flora that inhabit the bottom of Arctic sea ice in spring and early summer. Samples of the bottom of the sea ice were collected and analysed for species composition, chlorophyll, and dissolved organic carbon content. The work is part of a continuing study of the productivity of ice-covered marine waters.

- *Biology, zoology: polar bear research,* western Arctic

  Principal investigator: I. Stirling, Canadian Wildlife Service

  The Canadian Wildlife Service study of the denning areas, movements, population dynamics and reproductive rates of polar bears was continued in 1971 in several parts of Arctic Canada. The Polar Continental Shelf Project contributed field support to studies in the Amundsen Gulf-Beaufort Sea area. The long-term objective of these studies is to relate bear distribution and movements to the distribution and movements of their prey (mainly seals) and to changes in sea ice conditions; and thus to aid development of a comprehensive polar bear management program.

- *Biology, zoology: ringed seal migration studies,* Beaufort Sea area

  Principal investigator: T.G. Smith, Fisheries Research Board

  A study was made of the feasibility of live capturing, tagging and branding of migrating ringed seals. The work is preliminary to a large-scale branding and tagging program in the western Arctic planned for 1973 and directed at the management of ringed seal populations, which form the basis of the hunting economy of many communities of Arctic Canada.

  The 1971 study was based at the Polar Continental Shelf Project station on Herschel Island. Of the 180 seals captured, 124 were tagged, branded and released. In co-operation with the University of Guelph, studies were also started on the blood chemistry and serum proteins of ringed and bearded seals.

- *Biology, zoology: biology of the greater snow goose,* eastern and central archipelago

  Investigator: J.D. Heyland, Quebec Wildlife Service

  Studies of the biology and population dynamics of the Greater Snow Goose by the Quebec Wildlife Service were continued in 1971. Vertical aerial photographs at a scale of 1:12,000 were taken repeatedly of the breeding range on Bylot Island in order to determine the numbers of breeding and non-breeding geese using the habitat.

  In co-operation with the Canadian Wildlife Service, a program of banding greater snow geese was undertaken to learn more of the migration routes of the geese and to study aspects of their population dynamics as related to hunting mortality. In July and August 1971, about 3,000 geese were banded on north-central Ellesmere Island, north Devon Island, Bathurst Island and northwestern Baffin Island.

  The Polar Continental Shelf Project contributed to field support and aerial photography.

- *Biology, general: effects of resource exploration,* Arctic archipelago

  Investigator: D. Muir, Canadian Wildlife Service

  A general reconnaissance survey was made of selected locations in the Arctic archipelago where industrial activities have been undertaken in connection with exploration for exploitable resources, to assess the present and potential effect of such activities on the ecology of the region. Emphasis was placed on determining the need for specific research to assess the sensitivity of the biota and the physical environment to disturbance by human activities, with the objective of developing operating specifications or monitoring procedures. The Polar Continental Shelf Project contributed to field organization and logistics support.

- *Geochemistry: composition of arctic streams,* Cornwallis Island

  Investigator: R.J. Allen, Geological Survey of Canada

  The Geological Survey of Canada instituted a geochemical study of the Arctic islands with the reconnaissance sampling of selected streams on Cornwallis Island. The Polar Continental Shelf Project contributed minor field support.

- *Geodesy: ocean tilt measurements,* James Bay

  Investigator: J.R. Weber, Earth Physics Branch and Polar Continental Shelf Project

  Experiments on the Arctic Ocean to measure the tilt of the surface of the ocean with respect to the geoid surface, begun in previous years by the Polar Continental Shelf Project in co-operation with the Earth Physics Branch, were continued. Improved versions of a sensitive hydrostatic level, incorporating a recording device, were designed and constructed and tested on the sea ice of James Bay. While further equipment improvement is necessary, consistent measurements were obtained of a significant ocean tilt with respect to the plumbline or level bubble. These appear to be the most reliable and accurate of such measurements yet made, and the results have considerable importance in geodetic, gravity, and oceanographic analysis. The work is related to the AIDJEX program (q.v.) and is being pursued with the objective of obtaining systematic measurements of the tilt of the Arctic Ocean during the main AIDJEX program in 1974–75.

- *Geology: mesozoic stratigraphy,* Yukon coastal plain and northern Richardson Mountains

  Principal investigator: F.G. Young, Geological Survey of Canada

  A continuing study of mainly Cretaceous rocks by the Geological Survey of Canada, with logistic support by Polar Continental Shelf Project, in order to outline the stratigraphic succession, its lateral variations and component depositional sequences, and to interpret ancient environments of deposition and related paleogeography. The information is relevant to the appraisal of coal reserves and areas favourable to petroleum accumulation.

- *Geology: stratigraphy, Palaeozoic,* northwest Devon Island

  Principal investigator: R.W. Kerr, Geological Survey of Canada

  The detailed study by the Geological Survey of Canada of the stratigraphy, structure and history of the Franklinian

geosyncline and Innuitian orogenic system was continued on Grinnell Peninsula of Devon Island. The Polar Continental Shelf Project contributed to field support.

- *Geology, marine:* Mackenzie River delta and Beaufort Sea

  Principal investigators: B.R. Pelletier, G. Vilks, Bedford Institute, C.J. Yorath, Geological Survey of Canada

  A continuing series of studies has been carried out by Bedford Institute and the Institute of Sedimentary and Petroleum Geology of the Geological Survey of Canada, with logistic support and field co-operation from Polar Continental Shelf Project, of the geology of the sediments, the processes of sedimentation, and the present and fossil organisms of the sea floor in an Arctic delta and continental shelf environment. Attention has been given to the regional and local structures in the sediments of the Mackenzie delta area and the submerged part of the Arctic coastal plain. Studies are also made of the underwater physiography, including submerged pingo-like structures and scour channels. Core samples of the bottom sediments, acoustic imagery, and seismic profiling were obtained by parties working from ships, from helicopters, and on the ice.

- *Geology, environmental:* Tuktoyaktuk

  Principal investigator: V.N. Rampton, Geological Survey of Canada

  Detailed mapping at a scale of 1:25,000 was carried out by the Geological Survey of Canada with the assistance of Polar Continental Shelf Project and Department of Indian and Northern Affairs to locate sources of gravel for construction and to delineate geologic problem areas in the vicinity of Tuktoyaktuk.

- *Geology, Quaternary:* Coastal Plain, Alaskan Boundary to Cape Bathrust

  Principal investigator: V.N. Rampton, Geological Survey of Canada

  An investigation by the Geological Survey of Canada with support from Polar Continental Shelf Project. Preliminary maps of terrain and surficial deposits at a scale of 1:125,000 were completed and placed on open file (GSC). Investigation of stratigraphy along the shores of Eskimo Lakes and Liverpool Bay was continued. Detailed mapping of Herschel Island was completed.

- *Geology, Quaternary:* Melville Island

  Investigation: D.M. Barnett, Geological Survey of Canada

  The study of the surficial geology and Quaternary history of the western Arctic archipelago, with emphasis on the apparent margin of active Pleistocene glaciation, was continued on southern Melville Island. The Polar Continental Shelf Project contributed field support.

- *Geology, glacial:* southern Ellesmere Island

  Investigator: W. Blake, Geological Survey of Canada

  The continuing investigation by the Geological Survey of Canada of the glacial geology and post-Glacial geological history of southern and eastern Ellesmere Island gave special attention to the distribution of datable horizons in raised beaches. The Polar Continental Shelf Project contributed logistic support.

- *Geology, glacial:* northeastern Ellesmere Island

  Investigator: J. England, Institute of Arctic and Alpine studies, University of Colorado

  A reconnaissance study, supported by the Polar Continental Shelf Project and the Geological Survey of Canada, was made of the Glacial and post-Glacial history of the Discovery Bay-Archer Fiord (Fort Conger) region of northeastern Ellesmere Island. Information was obtained on the differential uplift of the region during and subsequent to the removal of the Pleistocene ice cover.

- *Geology, geophysics: permafrost investigations:* Mackenzie delta and valley: Tuktoyaktuk to Fort Simpson

  Principal investigators: J.A. Hunter, Geological Survey of Canada, J.E. Wyder, Geological Survey of Canada (presently Kenting Exploration Service)

  A research program by the Geological Survey of Canada in co-operation with Polar Continental Shelf Project to evaluate the potential uses of surface resistivity and various borehole geophysics techniques in the Mackenzie valley transportation corridor, together with an experimental program for developing methods of coring permanently frozen ground. The work included an experimental study of the use of "shallow seismic" techniques to investigate the occurrence, depth and thickness of permafrost in different geological settings.

- *Geomorphology, geophysics: ground ice investigations:* Mackenzie River delta and Tuktoyaktuk Peninsula

  Principal investigator: J.R. Mackay, Geological Survey of Canada, and the University of British Columbia

  Field support was provided for resistivity and seismic studies on the occurrence of ground ice and of permafrost thickness; on the origin and growth of ground ice; and on temperatures in permafrost.

- *Geomorphology: beach studies,* Devon Island

  Principal investigator: S.B. McCann, McMaster University

  Field support was provided to studies of the development of beaches under Arctic conditions, part of a continuing series of investigations of the geomorphology and physical geography of southwestern Devon Island and southern Cornwallis Island.

- *Geormorphology, landform analysis, photogrammetry,* Cornwallis Island

  Investigator: J. Howarth, University of Ottawa

  The Polar Continental Shelf Project and the Inland Waters Branch, Department of the Environment, provided large-scale aerial photography of a specially targetted area on southern Cornwallis Island as a contribution to a study of Arctic terrain analysis.

- *Geothermal studies:* Arctic islands and mainland

  Investigator: A.M. Jessop, A.S. Judge, Earth Physics Branch

  Measurements of the flow of heat from the earth's interior have been continued by the Earth Physics Branch in collaboration with the Polar Continental Shelf Project. The increased amount of drilling in the Canadian North has made possible the preservation, to depths of 600 m, of 11 wells in the Arctic Islands and a further five on the Arctic mainland. Temperature measurements are made at yearly intervals in these wells to determine the thermal recovery from drilling and the equilibrium geothermal gradient. A combination of the geothermal gradient and the thermal conductivity of the surrounding rock, determined from measurements on drill-cuttings combined with well-log interpretations, yields the heat flow. The equilibrium temperatures allow determination of the permafrost thickness at the location.

A program was commenced, in conjunction with the Geological Survey to study the thermal regime of the subsurface and to measure the thermal parameters of the overburden material in permafrost terrains. First results were obtained in the summer of 1971 from the vicinity of Fort Good Hope, NWT.

- *Geomagnetism:* Lincoln Sea

  Principal investigators: J.M. Delaurier, E.R. Niblett, Earth Physics Branch

  The joint study by the Earth Physics Branch and the Polar Continental Shelf Project of selected geomagnetic phenomena in the Arctic archipelago and adjacent islands was continued. During April and May, four 3-component fluxgate magnetometers were stationed on the ice of Lincoln Sea north of Alert to check the extension of the linear zone of enhanced electromagnetic conductivity that has been traced through northeastern Ellesmere Island. The recorded variations in geomagnetic field indicate that the conductivity anomaly extends at least 30 km into the Lincoln Sea basin.

- *Geophysics, marine:* inshore Beaufort Sea and Mackenzie Delta

  Principal investigator: J.M. Shearer, Geological Survey of Canada

  A study was made of the sediments of the submerged delta of the Mackenzie River, using ship-borne seismic and sonar techniques as part of the continuing study by the Geological Survey of the structure and geological development of the Mackenzie delta-Beaufort Sea region. The Polar Continental Shelf Project provided field support, communications and positioning.

- *Glaciology, climatology:* Meighen Icecap, Meighen Island

  Principal investigator: B. Barge, contractor to Polar Continental Shelf Project

  A continuing study by the Polar Continental Shelf Project of the behaviour of a small Arctic icecap and its influence on, and reactions to the local climate. Emphasis is on the energy exchange between the atmosphere and the earth's surface.

  In 1971 further data were obtained on the energy transfer due to local winds, and a start made on the comprehensive analysis of radiation and climatic information collected since 1960.

- *Glaciology, climatology:* Axel Heiberg Island

  Principal investigator: F. Muller, McGill University

  Mass balance studies of a small and a medium-sized valley glacier were continued by the McGill University Axel Heiberg Expedition, in conjunction with meso-climatic measurements in order to establish the long-term relationship of ice masses to climate in a high Arctic environment. In 1971 particular emphasis was given to the radiation balance of the glaciers and surrounding tundra. A study of the relationship between glacier velocity fluctuations and the hydrological regime, carried out over the past several years on White Glacier in west-central Axel Heiberg Island, was completed. The work is supported by the National Research Council and the Polar Continental Shelf Project.

- *Glaciology: mass balance,* central Ellesmere Island.

  Investigator: U. Embacher, Dept. of the Environment.

  Field support was given by the Polar Continental Shelf Project to the measurement of mass balance on valley glaciers in the Tanquary Fiord area of central Ellesmere Island, as part of the continuing survey of selected Arctic glaciers by the Inland Waters Branch of the Dept. of the Environment.

- *Glaciology: gravity measurements,* Penny Icecap, Baffin Island

  Investigator: J.R. Weber, Earth Physics Branch and Polar Continental Shelf Project

  A re-survey was made of a network of stations on the summit of Penny Icecap, as part of a long-term program to determine the mass balance and movement of the ice mass, and to investigate the feasibility of determining absolute changes in thickness by periodic gravity surveys.

- *Glacier physics:* Meighen Icecap, Meighen Island.

  Principal investigator: W.S.B. Paterson, Polar Continental Shelf Project

  The study of the mass balance, flow dynamics, and history of the Meighen Icecap was continued. The rate of closure of the open borehole that penetrates the icecap near its summit was measured at various depths, and in the laboratory, petrographic and geochemical analysis of the entractor core was continued. Selected samples were submitted for isotopic age determination.

- *Glacier physics:* Melville Island Icecaps.

  Principal investigator: W.S.B. Paterson, Polar Continental Shelf Project
  Field leader: L. Lundgaard, Polar Continental Shelf Project

  Since 1961 the Polar Continental Shelf Project has collected information on the four small icecaps on Melville Island. These icecaps are the "direct" and apparently the thinnest extensive bodies of perennial ice in North America, and they are of considerable climatological, glaciological and geological interest because they appear to be very sensitive to climatic change and their present and past behaviour can tell us much about the evolution of the Arctic landscape.

  For the sixth successive year, preparations were made for a precision aerial survey of targeted stations on the icecaps, but weather conditions did not permit the required photography. Scientific work on the icecaps was therefore confined to routine mass balance measurements.

- *Glacier physics:* Devon Island Icecap

  Principal investigators: W.S.B. Paterson, R.M. Koerner, Polar Continental Shelf Project

  After two years of preliminary geophysical and glaciological study, a site was selected on the icecap of Devon Island for a borehole which, it is hoped, will provide information on the physical characteristics and behaviour of an "active" Arctic icecap and whose core should provide evidence of precipitation, particulate fallout, and deformational history over the past several thousand years. Unfortunately, the borehole was terminated at a depth of approximately one-third the thickness of the icecap, owing to failure of the drilling equipment. The core recovered from the incompleted hole has yielded a continuous sample through layers of the icecap accumulated over the past 2,000 years. The incompleted hole has been equipped with instruments left in place to provide thermal and deformational information that may be compared with a new hole which is planned nearby in the near future.

- *Glaciology, photogrammetry and aerial photography,* Arctic archipelago.

  Investigator: K.C. Arnold, Department of the Environment

The Polar Continental Shelf Project and the Inland Waters Branch of the Department of the Environment have combined in a program of photogrammetry and aerial photography of Arctic ice and snow masses. In 1971 terrestrial surveys were made on Meighen and Ellesmere islands to evaluate methods of determining volume changes in glaciers by photogrammetric methods, and large-scale vertical aerial photographs were taken of selected glaciers and perennial snow patches throughout the archipelago.

- *Glaciology: ice islands,* Beaufort Sea

  Investigators: A. Kovacs, Cold Regions Research and Engineering Laboratory, P.F. Cooper, Polar Continental Shelf Project

  In the spring of 1971 a number of small "ice islands" (tabular icebergs presumably broken from the ice shelf of Ellesmere Island) were present in shallow water off the Mackenzie River delta and the Yukon coastal plain. As many of these were in water too shallow to float them under normal conditions, their presence, and the manner of their arrival and departure, was of considerable interest in view of plans for offshore industrial operations and construction. Studies were made by the Polar Continental Shelf Project and under contract for the Department of Public Works to determine the geometry and hydrographic setting of the ice islands and whether they had significantly gouged the sea floor during their movement.

- *Gravity: regional surveys,* Beaufort Sea and Banks Island

  Principal investigator: L.W. Sobczak, Earth Physics Branch.

  Regional mapping of gravity by the Earth Physics Branch in collaboration with the Polar Continental Shelf Project was carried out as part of the continuing gravity survey of Canada. In 1971, approximately 1600 gravity measurements were taken on the sea ice over the Beaufort Sea at a station interval of about 7 kilometers and about 900 measurements were taken over Banks Island at a station interval of about 12 kilometers. The work was integrated with hydrographic surveys (see Hydrography: Beaufort sea, offshore).

  A gravity map is being compiled for the Beaufort Sea and Banks Island at a scale of 1:1,000,000.

- *Gravity: interpretation,* Arctic Canada

  Investigators: R.A. Gibb, L.W. Sobczak, J.W. Tanner and various members of the Earth Physics Branch and Geological Survey of Canada.

  The extensive regional gravity surveys of the land and marine areas of Arctic Canada by the Earth Physics Branch, with support from the Polar Continental Shelf Project, have provided information for studies of vertical movements of the Earth's surface. These movements are related to post-glacial rebound, and the eustatic deformation of the Earth due to the formation and melting of continental ice sheets. The relative vertical movements are large, and demand a re-evaluation of what is meant by "eustatic sea level change". Using various simplified models of the earth, it has been concluded tentatively that there is no evidence of important eustatic change of sea level in northern North America in the past 6,000 years, and that movements whose evidence is conspicuous have been associated with mechanical loading and rebound. If this is true, information on past sea levels, when sufficiently widespread, can be a useful means of studying the deep physical structure and mechanical behaviour of the Earth.

- *Gravity, ground ice investigations,* Tuktoyaktuk Peninsula and Richards Island.

  Principal investigator: V.N. Rampton, Geological Survey of Canada.

  The Polar Continental Shelf Project provide field assistance to experimental studies by the Geological Survey of Canada that use detailed spatial variations in gravity to locate and define discrete bodies and discontinuous layers of ground ice in poorly consolidated sediments.

- *Hydrography,* Beaufort Sea, offshore

  Principal investigator: G.E. Wade, Polar Continental Shelf Project, seconded from Central Region, Canadian Hydrographic Service.

  The Polar Continental Shelf Project hydrographic unit, in collaboration with the Central Region, Canadian Hydrographic Service, completed reconnaissance bathymetric surveys of 68,690 square kilometres of central Beaufort Sea between Banks Island and Long. 141°W, for charting on a scale of 1:500,000. The survey covered parts of the continental slope and the floor of the Canada Basin, and required 1,639 soundings through the ice, with positions controlled by the PCSP Decca 6F Lambda chain based on Hooper Island. The work was done by helicopters based at a drifting ice camp approximately 300 kilometers north of Tuktoyaktuk. The work was integrated with regional gravity surveys (see Gravity: regional surveys: Beaufort Sea and Banks Island).

- *Hydrography and integrated marine surveys,* Beaufort Sea, inshore

  Principal investigator: S. Huggett, Pacific Region, Canadian Hydrographic Service.

  Officers and scientists of the C.S.S. *Parizeau,* from the Pacific Region, Canadian Hydrographic Service, carried out 17,500 kilometers of sounding on the continental shelf north of the Tuktoyaktuk Peninsula and in the north entrance to Liverpool Bay, with survey positioning support plus communications and local expediting provided by the Polar Continental Shelf Project. Magnetometer readings were taken throughout and over much of the area; bottom samples were obtained at five-mile intervals..

- *Hydrography,* Arctic Archipelago.

  Investigators: Officers of the Atlantic Region, Canadian Hydrographic Service, under the direction of R.C. Melanson, Regional Hydrographer.

  Using position control surveys, pre-season field preparations, and on-site logistics, minor field support was provided by the Polar Continental Shelf Project to the Atlantic Region, Canadian Hydrographic Service, in connection with hydrographic surveys and environmental studies from CCGS *Labrador* in Viscount Melville sound and from CCGS *John A. MacDonald* along the eastern Arctic Sea supply route (including Tanquary Fiord, Wellington Channel, Maury Channel).

- *Hydrography;* Nares Strait

  Principal investigator: G.E. Wade, Polar Continental Shelf Project, seconded from Central Region, Canadian Hydrographic Service.

  The Polar Continental Shelf Project hydrographic unit, in co-operation with Central Region, Canadian Hydrographic Service, undertook special surveys in two areas in Nares Strait:

  — A total of 581 through-the-ice bathymetric observations was taken in an area of 1,357 square kilometers between Wrangel Bay and Hall Basin in

Robeson Channel, for charting on a scale of 1:100,000;
- Position surveys, and 240 measurements of water depth were obtained in a strip across Kennedy Channel in the vicinity of Hans Island.

The hydrographic stations in Nares Strait were controlled by the Motorola Radio Positioning System.

- *Hydrology.* Mackenzie River basin and Arctic archipelago.

  Principal investigators: D.K. MacKay, E. Fowler, Department of the Environment.

  The Polar Continental Shelf Project provided field assistance to various aspects of a comprehensive Arctic hydrology program of the Inland Waters Branch of the Department of the Environment. Several of these activities were associated with the studies for the Mackenzie Valley Transportation Corridor, and comprised limnological hydroclimatological and dendrochronological as well as river flow studies in the Mackenzie River and selected tributaries; another study included hydrometric measurements on streams in the central archipelago.

- *Oceanography: acoustics under sea ice cover,* Nares Strait.

  Principal investigator: A.R. Milne, Defence Research Establishment, Pacific

  Logistics support and special hydrographic information were provided to a study by the Defence Research Board of Canada of acoustic and other properties of the ice-covered waters of Robeson Channel, northern Nares Strait.

- *Oceanography, physical: flow measurements (part of AIDJEX),* Beaufort Sea.

  Principal investigator: L.K. Coachman, University of Washington.

  Full logistic support was given by the Polar Continental Shelf Project to a program of studies of the sea ice-ocean stress relationships and geostrophic flow in the eastern Beaufort Sea in March and April. Direct current measurements were made in the boundary, Ekmann, and deeper layers, and mass field measurements were obtained simultaneously at three stations separated by approximately 10 and 20 kilometers for two weeks. The work was part of the 1971 pilot study for the AIDJEX program (q.v.).

- *Oceanography, Arctic,* Greely Fiord and Cambridge Bay

  Principal investigator: E.L. Lewis, Department of the Environment.

  Minor logistic support was provided by the Polar Continental Shelf Project to the continuing program of Arctic oceanography undertaken by the Frozen Sea Research Group of the Marine Sciences Branch of the Department of the Environment. Field work in 1971 included measurements of currents beneath a growing sheet of sea ice, the changes in sea water properties and water structure during freezing and thawing.

- *Oceanography – climatology: The North Water – Baffin Bay Project,* Baffin Bay and Smith Sound.

  Project co-ordinators: J.E. Sater, Arctic Institute of North America; Chairman, Advisory Committee: A.E. Collin, Department of the Environment.

  Started in 1966, the North Water-Baffin Bay Project is a long-term multi-discipline study of the oceanographic and meteorological conditions and processes in the "North Water" area of northern Baffin Bay, undertaken to increase understanding of the interactions between Arctic marine, atmospheric and terrestrial environments. The program includes physical and biological oceanography, meteorology, glaciology, and sea ice studies. In 1971 additional oceanographic data were obtained, a reconnaissance of sites for three paired series of meteorological-glaciological stations was carried out, and supplies were deposited for the proposed year-round study.

- *Sea Ice: aerial surveys,* Arctic archipelago, Arctic Ocean.

  Principal investigator: D.G. Lindsay, contractor to Polar Continental Shelf Project.

  A systematic aerial survey of the distribution, nature and movement of sea ice in all the main channels of the archipelago and in the adjacent Beaufort Sea and Arctic Ocean is carried out by the Polar Continental Shelf Project to provide regional continuing information to serve as background to the intensive surveys undertaken by the Atmospheric Environment Service, Department of the Environment, along the shipping routes. The 1971 survey was the eleventh successive year of this operation; flights were carried out from mid-March until mid-October, covering the entire area about once every three weeks during summer and autumn. Additional surveys were made, approximately once a month, of the inner Beaufort Sea and Mackenzie delta during the winter.

- *Sea Ice: dynamics: Arctic Ice Dynamics Joint Experiment (AIDJEX),* Beaufort Sea.

  Co-ordinator of Canadian activities: E.F. Roots, Polar Continental Shelf Project.

  AIDJEX is a co-operative multi-discipline investigation of the dynamic behaviour of sea ice, and of the transfer of kinetic and thermal energy between the atmosphere and ocean through a complete or partial ice cover. The objective is to obtain quantitative information, and an understanding of the processes involved, that will allow calculation and prediction of the movement of sea ice, the forces it may exert and the exchange of energy between ocean and atmosphere, under given environmental conditions. Such information and understanding, at present lacking, is necessary for forecasting the movement and variations in behaviour of sea ice, understanding climatic trends, and for planning or designing fixed or moving structures and transport routes associated with resource development in or near the Arctic Ocean. The magnitude and difficulty of the field observational program, and the complexity of the theoretical analysis required, exceed the resources or expertise of any one agency, and has let to a voluntary co-operative exercise which at present encompasses 15 government and university research bodies in three countries (Canada, U.S.A., Japan).

  The major AIDJEX field activities in 1971 comprised the second pilot study to develop instruments and techniques for air, water and ice measurements, and to obtain preliminary data to test theoretical concepts prior to a major all-season field experiment presently planned for 1974. The 1971 pilot study, supported by the Polar Continental Shelf Project at its hydrographic-gravity survey camp in eastern Beaufort Sea approximately 300 kilometers north of Tuktoyaktuk, involved 55 research personnel and was probably the most sophisticated and intensive scientific study yet undertaken in the Arctic Ocean. About 20 different research projects in oceanography, meteorology, sea ice glaciology, and remote sensing were carried out.

- *Sea Ice: dynamics: Wind Stress Measurements (AIDJEX in part),* Beaufort Sea and Robeson Channel.

  Principal investigator: E. Banke, Atlantic Oceanographic Laboratory, Bedford Institute.

  A study was made of the wind stress over multi-year Arctic ice at the Polar Continental Shelf Project camp in eastern Beaufort Sea, to determine the drag coefficients on the upper surface of the ice for use in prediction models of sea ice drift, and energy budgets. This work was mainly a contribution to AIDJEX.

  A survey was also made of Robeson Channel with a view to determining its suitability for measurements of atmospheric turbulence over an ice-covered surface.

- *Sea Ice: dynamics: pressure ridges,* Beaufort Sea (AIDJEX in part).

  Investigator: A. Kovacs, Cold Regions Research & Engineerings Laboratory.

  Studies were made of the distribution and pattern of pressure ridges and fracture systems, and of the morphology and mechanical properties of first year and multi-year pressure ridges in Beaufort Sea near the Polar Continental Shelf Project camp, as part of the AIDJEX 1971 Pilot Studies.

  This work was followed by investigations of pressure ridges and ice islands near the Mackenzie delta for the Arctic Petroleum Operators' Association. At the request of the association, the Polar Continental Shelf Project provided assistance for this study, which included determination of the underwater geometry of the ridges and their physical and mechanical properties.

- *Sea Ice: dynamics of first year ice,* Mackenzie delta area.

  Investigator: P.F. Cooper, Polar Continental Shelf Project.

  A continuing study is under way on the strain distribution in the annual sea ice in Kugmallit Bay near Tuktoyaktuk and immediately offshore from the Mackenzie River delta to determine the forces generated in the ice by temperature changes, wind and other factors.

  In the autumn of 1971, stakes were positioned on newly consolidated sea ice east of Herschel Island, and their positions surveyed periodically during the winter. Surface wind temperature and pressure observations were taken at Herschel Island in an attempt to determine the relationship, if any, between local weather conditions and ice movement.

- *Sea Ice: Physical characteristics:* albedo studies, Beaufort Sea

  Principal investigator: P. Langleben, McGill University.

  A continuing study of the physical characteristics of sea ice and the changes with variations in temperature, aging, and decay has been carried out by the Ice Research Centre, McGill University, under contract to the Polar Continental Shelf Project. Investigations in 1971 included measurements of reflected radiation and thermal flux over one-year ice near Tuktoyaktuk under spring conditions.

Plans for 1972

The 1972 program will be mainly a continuation of the 1971 projects. The main emphasis for regional and systematic surveys will again be placed on the Beaufort Sea area. Surveys in marine geology, gravity, hydrography and both regional and special studies of sea ice will receive special attention, in anticipation of the demand for information relevant to transportation and resource development in that region.

There will be increasing emphasis on the studies of terrain and the physical environment, its behaviour when disturbed, and the potential effects of a pipeline on road development and the growth of communities.

In addition to the work at the Beaufort Sea and lower Mackenzie River area, which will be carried out mainly from the base at Tuktoyaktuk, studies will be continued throughout the archipelago, co-ordinated from Resolute Bay. The glaciological work on Meighen Island, Devon Island and on Melville Island will be continued throughout 1972 and the major biological program on Bathurst Island will be continued. Archaeological studies are planned for Banks Island and Dundas Island. Support of the high Arctic tundra studies of the International Biological Program will be continued. Preparations for the Arctic Ice Dynamics Joint Experiment (AIDJEX), whose main program is scheduled for 1974 are continuing and a major pilot study is planned for the western Beaufort Sea in 1972.

It is expected that the 1972 field program will engage about 225 persons including personnel under contract and crews of supporting aircraft. Aerial transport in the field will be provided by one Bell 205A helicopter, two Bell 206B helicopters, one deHavilland DHC–3 Otter, one deHavilland DHC–6 Otter and one Beechcraft D–18S. Ground transport includes nine wheeled or tracked vehicles and about 15 motor toboggans and small amphibious vehicles. The offshore studies will be co-ordinated with CSS *Parizeau* and other vessels, as appropriate. In addition to the base camp at Tuktoyaktuk and the facilities at Resolute, the 1972 plans require that the Polar Continental Shelf Project operate camps at Herschel Island, Hooper Island, Atkinson Point, Meighen Island, Baillie Island, Melville Island, Bathurst Island, and Devon Island. It is expected that the Polar Continental Shelf Project base at Alert will be re-activated for a brief period.

RESOURCE MANAGEMENT AND CONSERVATION BRANCH

Responsibilities

The Resource Management and Conservation Branch manages the mineral deposits beneath Hudson Bay and Hudson Strait. The branch exercises comprehensive statutory authority and full regulatory control over the development of mineral resources in these and other offshore areas under the jurisdiction of the department and in accordance with the Oil and Gas Production and Conservation Act, and the Public Lands Grants Act.

Long-term Plans

The branch will continue to manage offshore mineral resources in those areas of the Canadian north administered by the department, in a manner consistent with the public interest and with special emphasis on:

- safety of human life,
- preservation of the environment,
- protection of marine life,
- maximum physical and economic conservation of resources,
- optimum return for Canada from these resources,
- co-ordinating offshore activities with the interests of other parties,
- maintaining industry investment on a continuing and orderly basis.

Review of 1971 Operations

Some 2,500 line-miles of marine seismic work was carried out by permit-holding companies in Hudson Bay during 1971. Airborne magnetometer and sub-sea geological surveys were also undertaken. Cost of the work was more than $2 million and brings to

some $13 million the cumulative total of exploration costs by industry in the Hudson Bay and Hudson Strait regions at the end of the year.

A total of 1,163 Canada oil and gas permits, covering 71.3 million acres, was held in the Hudson Bay and Hudson Strait areas by more than 30 different interests at 31 December 1971. During the year 642 permits were terminated and the acreage reverted to the Crown in compliance with the Canada Oil and Gas Land Regulations.

SURVEYS AND MAPPING BRANCH

Geodetic Survey of Canada

Responsibilities

In the north the Geodetic Survey is responsible for providing a framework of precise horizontal and vertical control to serve as a basis for lower order surveys which may be carried out by other government agencies or by private enterprise. These surveys also provide basic information for research in solid earth science. The Geodetic Survey is also responsible for surveys to provide control for the 1/50,000 mapping program and for special surveys for the development work of other government agencies.

Long-term Plans

Long-term plans for operations in the north include the extension and densification of the precise horizontal and vertical control framework and the provision of control for 1/50,000 mapping in those areas which are still unmapped at that scale. Aerodist operations will be continued in northern Manitoba and northern Ontario.

Review of 1971 Operations

Aerodist operations established 21 new first-order stations, 15 second-order and two third-order in two blocks in northern Manitoba, northern Saskatchewan and the southern part of the District of Mackenzie. In Manitoba the network extended from Island Lake – Gillam on the east to connect with the aerodist network along the Manitoba – Saskatchewan boundary. In northern Saskatchewan and the District of Mackenzie the network filled the area bounded by the aerodist networks on the south and west and the triangulation networks on the north and east.

In the District of Mackenzie an integrated system of second-order grid traversing and trigonometric and barometric heighting was used to establish survey control and control for the 1/50,000 mapping program over a large block lying between 112 and 120 degrees West, and 63 and 67 degrees North.

The satellite triangulation program, in co-operation with the United States National Ocean Survey, was continued. In March the Cambridge Bay station was moved to Frobisher Bay, where it was stored until operations resumed in October. Also in March the Whitehorse station was moved to St. John's, Newfoundland, where operations were resumed immediately. This program will be completed in March 1972. In southern Labrador, in support of the 1/50,000 mapping program, the barometric vertical control was strengthened and updated over a wide area.

Plans for 1972

In northern Ontario aerodist operations will be continued in the area between James Bay, Hudson Bay and the northern Ontario aerodist network. In the Yukon Territory an integrated survey will be carried out to provide horizontal and vertical control over a block of eighty 1/50,000 map sheets in the Peel Plateau area.

In northern Manitoba and the southern part of the District of Keewatin a project to update control and provide additional control for 1/50,000 mapping will be carried out. In western Quebec, north of the 54th parallel, the lower-order control systems will be strengthened by the addition of internal ties and ties to the first-order framework. New first-order level lines will be established in the Watson Lake – Ross River area of the Yukon, and in the District of Mackenzie a start will be made on a new first-order level line down the Mackenzie River from Providence.

Legal Surveys

Responsibilities

To carry out surveys to enable land or resource transactions connected with the administration and development of public or other lands.

Long-term Plans

The long-term plans of this division are dependent upon the planning and development of other government departments, chiefly Indian Affairs and Northern Development. It is proposed to carry out subdivision surveys in the settlements in the north, the amount of work each year being determined by the development of these settlements by the Department of Indian Affairs and Northern Development. Similarly, surveys of group lots, campsites and other parcels will be made as development along highways is undertaken by the Territorial governments. In the northern parts of the western provinces the development of Indian Reserves and the setting up of new ones result in further work for the division. The laying out of lots for airstrips, the installation of navigational aids, and similar work has been and will be carried out in conjunction with the Ministry of Transport. It is intended to establish co-ordinate control surveys in the major settlements in the north. The legal survey necessary to the development of offshore resources called for research and study of methods.

Review of 1971 Operations

Yukon Territory

Subdivision surveys were carried out at Tagish (37 lots) and Ross River (5 lots).

A total of 34 parcels was surveyed at Whitehorse, Tagish, Dawson, Watson Lake, Daughney Lake, Little Salmon Lake, Atlin Lake, Minto and various sites along the highway system.

A total of 4 1/2 miles of highway was surveyed at Whitehorse and Carcross.

Two historic sites were surveyed on Bonanza Creek near Dawson.

One survey of a parcel at Mile 928, Alaska Highway was carried out as part of the division's inspection responsibilities.

Northwest Territories

Subdivisions were surveyed at Pangnirtung (65 lots), Lake Harbour (52 lots), Frobisher Bay (51 lots), Clyde River (29 lots), Norman Wells (76 lots), Cambridge Bay (50 lots), Fort Good Hope (21 lots), Arctic Red River (23 lots), Tuktoyaktuk (16 lots), and Hay River (9 lots).

A total of 39 parcels was surveyed at Inuvik, Aklavik, Arctic Red River, Fort Good Hope, Fort Norman, Fort Smith, Hay River, Fort Providence, Edzo, Jean-Marie River, Nahanni Butte and Fort Simpson.

Six miles of highway were surveyed at Fort Simpson, Arctic Red River, the Junction of Highways 1 & 3 and the Junction of Highways 1 & 7.

One historic site was surveyed at Fort Simpson.

British Columbia

A subdivision of five parcels was surveyed in Kitwangar I.R. No. 1.

Boundary surveys were performed at Pack River I.R. No. 2 (1 3/4 miles), Driftwood River I.R. No. 1 (2 3/4 miles), Cheztainya Lake I.R. No. 11 (1 1/2 miles), North Tacla Lake I.R. No. 10 (1/4 mile), North Tacla Lake I.R. No. 8 (1 mile) and North Tacla Lake I.R. No. 11A (1/2 mile).

Alberta

Nineteen miles of exterior boundary were surveyed at Driftpile I.R. No. 150, a township subdivision was surveyed at Wabasca I.R. No. 166C, and an inspection survey was carried out at Sucker Creek I.R. No. 150A.

Saskatchewan

Ten miles of artificial boundary and three lots were surveyed at Southend I.R. 200.

Manitoba

Two new reserves were surveyed (York Factory 1 and York Factory 2).

Plans for 1972

Yukon

The program includes a resurvey in the Mayo townsite; subdivision at Tagish (45 lots), Lake Laberge (17 lots) and Carcross (8 lots); a resurvey of part of the Canol pipe line R/W and 16 parcels in various locations.

Northwest Territories

Subdivision surveys are to be done at Edzo (28 lots), Fort Simpson (40 lots), Pine Point (20 lots), Norman Wells (38 lots), Fort Good Hope (25 lots), Tuktoyaktuk (30 lots), Fort McPherson (approximately 85 lots), Coral Harbour (20 lots), Cape Dorset (160 lots), Pond Inlet (20 lots) and Frobisher Bay (number of lots in this subdivision undertain at present).

In addition to this, 15 parcels are to be surveyed at various sites.

British Columbia

Eight requests have been received for surveys in reserves north of 55° latitude; but at present it is impossible to say how many will be carried out in 1972.

Alberta

Boundary surveys are planned at Utikoomak Lake I.R. Nos. 155, 155A and 155B; township subdivision surveys at Wabasca I.R. No. 166, Hay Lake I.R. 209, John D'or Prairie I.R. No. 215 and Fox Lake I.R. No. 162; with preliminary surveys at Hay Lake I.R. No. 209 and Upper Hay River I.R. No. 212.

Saskatchewan

Boundary surveys are planned at Lac La Ronge I.R. No. 156, Kitsakie I.R. No. 156B, Potato River I.R. No. 156A, Sucker River I.R. No. 156C, Stanley I.R. Nos. 157 and 157A, Old Fort I.R. No. 157B, Four Portages I.R. No. 157C, Fox Point I.R. No. 157D, Little Hills I.R. Nos. 158, 158A and 158B.

Manitoba

Two new Reserves, Fox Lake and Shamattawa, are to be surveyed.

Topographical Survey

Responsibilities

To produce and maintain the National Topographic Series of maps at the 1/25,000, 1/50,000 and 1/250,000 scales; to administer through the Interdepartmental Committee on Air Surveys the acquisition of aerial photography for mapping and development purposes.

Long-term Plans

The long-term plans of the division are to complete mapping coverage of Canada at the 1/50,000 scale, observing priorities of map users, and to maintain up-to-date mapping done at the 1/25,000 and 1/250,000.

Review of 1971 Operations

At a scale of 1/50,000 ninety-eight maps of various areas including northern Labrador, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia and the Territories were compiled and forwarded for reproduction. In addition 104 maps along the route of the proposed Mackenzie Valley pipeline were brought to the advance-print stage. Two maps of the north at a scale of 1/250,000 were revised.

Thirty-five 1/31,680-scale photomap sheets of various areas of the Northwest Territories were produced for the Department of Indian Affairs and Northern Development.

Special plots at larger scales were made at Hay River, Baker Lake, Eskimo Harbour, Lake Harbour, Clyde River, Grise Fiord and Leffert Glacier. In addition approximately 35 site plans of the north were updated.

1971 Aerial Photography in Northern Canada

Northwest Territories	16,219 line miles
Yukon	3,606 line miles
British Columbia	4,388 line miles
Northern Alberta	146 line miles
Manitoba	6,390 line miles
Saskatchewan	2,766 line miles
Northern Ontario	2,100 line miles
Northern Quebec	5,098 line miles
Total	40,713

Map Production Directorate

Responsibilities

To publish the National Topographic Series of maps produced by the Topographical Survey and to produce and maintain small-scale maps such as park, electoral, and general purpose maps, the National Atlas and aeronautical charts.

Five World Aeronautical Charts will be produced in 1972 covering the Yukon and Northwest Territories.

TASK FORCE ON NORTHERN OIL DEVELOPMENT

The Task Force on Northern Oil Development was established in December 1968 to advise the federal government on matters relating to northern oil development, transportation routes that might be used, and particularly, the effect of pipeline construction and operation in the north. The task force is chaired by the deputy minister of Energy, Mines and Resources and includes the deputy ministers of Indian Affairs and Northern Development, the Environment, and Transport, and the chairman of the National Energy Board.

The task force works through five committees. The Pipeline Engineering Committee provides a continuing appraisal of all matters relating to the construction and operation of oil and gas pipelines in the north, with emphasis on construction procedures, design and operational criteria. It has been recently concerned with engineering guidelines for pipeline construction. The Economic Impact Committee is responsible for carrying out studies to determine the expected effect on the economy of the building and operating of northern pipelines and has been giving particular attention to the possible effects on the balance of payments of the large capital expenditures that are likely to be involved for northern pipelines. The Transport Committee has completed its assessments of the voyages of the *Manhattan* which were made in 1969 and 1970, and more recently has been investigating the feasibility of harbours in the Arctic and the need for improvement in inland water transport in the north. The Marketing Committee is responsible for assessing the effect of northern oil and gas on the energy supply and demand patterns of North America and has been giving particular attention to

marketing patterns in the western part of the continent. The Environmental-Social Committee is responsible for carrying out environmental and social studies in connection with various aspects of pipeline problems, and, to this end, is working with the support of the departments of Energy, Mines and Resources, Indian Affairs and Northern Development, and the Environment, on a three-year program, budgeted annually at $5 million.

During 1971 the task force met several times with industry groups who are proposing to build a northern pipeline. In addition there was continuing contact between the committees of the task force and representatives of industry, the universities and the general public. The various meetings that are held provide a forum for the exchange of information to ensure that all concerned are informed of the progress being made towards the safe and economic construction of northern pipelines and of the environmental, engineering, economic, and social problems yet to be resolved.

DEPARTMENT OF THE ENVIRONMENT

The Department of the Environment officially came into being on 11 June 1971. Its formation saw the amalgamation of a number of former departments and agencies with responsibilities for the quality of the environment and for renewable resources. They included: the Department of Fisheries and Forestry, the Fisheries Research Board; the Canada Land Inventory of the Department of Regional Economic Expansion; the Canadian Wildlife Service of the Department of Indian Affairs and Northern Development; the Meteorological Service of the Ministry of Transport; the Water Sector of the Department of Energy, Mines and Resources; and the Air Pollution Control and Public Health Engineering Divisions of the Department of National Health and Welfare.

Responsibilities

- To protect, preserve, and enhance the natural environment of Canada.

ATMOSPHERIC ENVIRONMENT SERVICE (AES)

Responsibilities

- To provide meteorological services and facilities.
- To undertake investigations in support of these services and to improve knowledge of the weather processes and climate of northern Canada.
- To carry out ice reconnaissance and provide ice forecasts and ice advisory service on the navigable waters of the north.
- To provide weather forecasts and weather advisory service.
- To maintain a network of weather observing stations, including 16 upper-air stations, so as to gather essential weather data on a daily and hourly basis.

Long-term Plans

- To provide more complete meteorological and related scientific services in the north, continuing to expand the station network and improving the equipment and techniques for data acquisition, using automation where possible.
- To complete a set of climatic studies for the entire Arctic region, including the preparation of synthesized climates for all potential airports, harbours, and settlements; a climatology to be available for action in environmental emergencies and publication of pertinent climatic parameters.
- To develop a network of automated climatological stations as well as a system for utilizing satellite data.
- To encourage personnel with more experience to serve in the north by improving living accommodation and services.
- To provide more opportunities for indigenous residents to carry out some of the meteorological and related scientific work in the north.
- To develop ice reconnaissance and ice forecasting so as to provide a year-round, all-weather service geared to meeting the growing economic needs of the north.

Review of 1971 Operations

The following stations were added to the synoptic and hourly weather network: Fort Liard, NWT and Old Crow, YT. The station at Cape Hopes Advance, Que., was moved to Koartak, Que. The observing stations at Old Crow, YT and Koartak, Que. are staffed by indigenous people under contract to AES. With Cape Dorset, NWT, this brings to three the number of surface weather stations staffed wholly by Eskimo or Indian employees.

Observations at Drake Point, Hecla, Satellite Bay, Towson Point, and Cape Norem, all in the NWT, were terminated during 1971 due to frequent repositioning of sites. At these sites were transportable non-directional beacons operated by various oil interests.

Weather stations were being operated by the following at the close of 1971: AES, 22; MOT Tel/Com, 16; ITT/ASI Dewline, 11; Contract, 12.

Five stations are staffed jointly by AES and MOT Tel/Com, giving a total of 56 observing stations in the Synoptic and Hourly Weather Network.

The Polar Continental Shelf Project for detailed weather observations at four points on Meighen Island has completed its fourth year. This project receives aid from AES in the form of instruments and equipment. PCSP also operates the surface weather station at Tuktoyaktuk "A", NWT (identifier TW), during the summer.

The Snow Survey Network north of 60° consisted of 24 stations, a decrease of two from 1970. The Noctilucent Cloud Network remained unchanged with 17 participating stations. The collecting of radioactive fallout samples is continuing at five stations as a joint project with the Radiation Protection Division of the Department of National Health and Welfare.

Two new installations of solar radiation equipment brought to 14 the number of stations north of 60° with recording radiation detectors. The Sunshine Recording Network was unchanged at 18 stations. Ozone observing was conducted at only one site in the Arctic. Autographic rain recorders were in operation at 10 sites north of 60°. The Autographic Wind Network increased by four to 22 stations.

The Visual Aurora Observing Program carried out by AES observing stations on behalf of the National Research Council was terminated in June 1971, at the request of NRC. A vast amount of data covering one solar cycle was accumulated.

Fifty-nine stations completed break-up and freeze-up reports on 53 bodies of fresh water and 38 bodies of salt water during 1971. Twenty-three stations participated in the collecting of ice thickness data.

Sixty-five percent of the stations north of 60° in the Synoptic and Hourly Weather Network were visited by meteorological inspectors in 1971.

There was no change in the number or location of the upper-air stations which maintained their full program of two rawinsonde ascents a day sending instruments to heights averaging over 90,000 feet to measure and transmit temperature, pressure, and relative humidity data throughout the ascent. These instruments were also tracked to determine the upper winds at various levels. Significant progress was made in the effort to achieve higher levels in upper-air and upper-wind observations.

In accordance with the agreed plan for a phased withdrawal of US staff at the upper-air stations at Alert, Eureka, Isachsen, Mould Bay and the weather office at Resolute, and a corresponding increase in Canadian personnel, all US nationals were withdrawn from Mould Bay and Isachsen and replaced by Canadian staff in November.

In addition, Canada has taken over all U.S. government property at the above sites, including expendable supplies, parts, equipment and vehicles, with the exception of certain upper-air equipment scheduled for later return to the USA. Replacement upper-air equipment was purchased and shipped to these sites in 1971. Observations at these stations included the following:

- Two scheduled upper-air soundings a day.
- Surface weather observations at three-hour intervals, except at Resolute where 24-hour coverage was provided.
- Solar and net radiation measurements.
- Sunshine record, snow survey and growth of sea ice.
- Total ozone and ozonesonde observations, soil temperature, noctilucent clouds, evaporation rates and radioactive fallout at Resolute.
- A super-neutron monitor for Atomic Energy of Canada was operated at Alert.
- Year-round station support for the Earth Physics seismological and magnetic programs was provided at Alert and Mould Bay.

The following additional programs were maintained:

- At Resolute a weather forecast and briefing office in support of air carriers operating in the area. A heavy increase in demand for this service in 1971 made it necessary to step up the normal eight hours a day coverage to 16 hours and at times to 24 hours during the peak of air activities.
- At Alert, Eureka, Isachsen, and Mould Bay, communication facilities in support of the meteorological systems, and to a limited extent point-to-point and air-to-ground communications in support of other scientific undertakings and local aircraft operations.
- The Aerodrome at Alert on a year-round basis; aerodromes at Eureka, Isachsen and Mould Bay primarily in support of the Meteorological sites. However, the aerodromes at the latter three sites were used extensively by other government and commercial agencies in the area.

At the four High Arctic stations Alert, Eureka, Isachsen, and Mould Bay, AES provided assistance to other government and commercial agencies and such services as room and board, unloading facilities, electrical power, and supporting communications, as could be provided without interfering with scheduled AES activities.

A regional approach to studies of northern climate has been adopted to provide Arctic exploration and development services with useful and prompt consultative climatological support. The preparation of regional climatologies for the Yukon and Mackenzie River valleys and the Beaufort Sea was initiated in 1971 with completion scheduled for 1972. Physical relationships and synoptic climatologies have been developed for these regions to provide by area, probability estimates of precipitation, temperature, winds and similar elements as well as critical weather changes.

A five-volume report was completed on *"A Climate Classification of the Northwest Territories for Recreation and Tourism"*. The report was designed as part of an "overview study" to meet broad policy and planning needs.

The Ice Central in Halifax issued a seasonal outlook for the summer break-up, 30-day ice forecasts and short-range tactical forecasts for Arctic and sub-Arctic waters from July until October. Ice observations and composite charts of conditions were broadcast from Edmonton and Halifax by radio facsimile for ships in western and eastern Arctic waters. A local broadcast on recent ice observations was also made routinely from Frobisher by station staff.

It was decided to move the ice forecasting facility to Ottawa, where it would be in closer touch with Marine Operations' Canadian Coast Guard and more accessible to other government departments concerned with activities in the north. The transfer was made in November.

During 1970 shipboard synoptic weather observations north of 60° N totalled 4,445, composed of 2,656 observations east of 90° W and 1,789 observations west of 90° W. Fifty-nine stations completed break-up and freeze-up reports on 53 fresh water bodies and 38 salt water bodies. Twenty-three regular weekly Ice Thickness Stations contributed data from freeze-up to break-up at selected sites having significant sea and fresh water exposures. Thirty-seven selected stations operated by a variety of agencies contributed daily "Shore Ice Reports" during the navigation season.

AES charter ice reconnaissance aircraft, two Douglas DC–4s and one Douglas DC–3, carried out 259 missions for a total of 2,213 flying hours. In addition to regular ice data acquisition almost 200 airborne facsimile ice chart transmissions were made from the three aircraft to the Canadian Coast Guard icebreaker fleet.

In addition to the main objective of ice reconnaissance, over 1400 hourly aerial meteorological reports were made on areas of potential danger from ice as well as significant sea mammal and wildlife sightings.

In a continuing co-operative venture with the Department of National Defence, AES Ice Observer personnel participated in 16 northern patrols at regular intervals throughout the year to obtain data on ice formations and movements. Formal training in ice observations was provided to participating aircrews.

Nine hundred days of shipboard duty were served by AES ice observers on Canadian Coast Guard icebreakers, from which 135 short-range ice reconnaissance flights were completed.

Efforts continued toward the development of remote sensors to assist in ice reconnaissance, using infrared, laser and aerial photography on our own aircraft and in co-operation with agencies and firms from the

United States. Publication of the *Ice Summary and Analysis* and *Ice Observations* series, break-up and freeze-up and ice thickness data was continued when possible.

Forecasts of high level winds and temperatures produced by a computer in Washington D.C. were distributed in Canada by facsimile for aviation. Weather forecasts for high levels produced by the Central Analysis Office in Montreal received similar distribution.

The weather office at Inuvik provided briefing and presentation service to many local and long-distance aircraft flights. Additional staff were provided at Resolute during the summer to handle the increased traffic.

Plans for 1972

Early in 1972 surface weather observing stations operated on contract will be established at Faro, YT and Johnson Point, NWT. A site survey and engineering study will be conducted in the Thelon River area, to explore the possibility of establishing a weather observing station about mid-way between Ft. Reliance and Baker Lake.

Continuous wind recording systems will be installed at three Dewline sites and an attempt will be made to increase surface observation at five selected Dewline sites in the Central Sector.

Plans for the High Arctic Weather Stations will:

- Complete the phase-out of US support, and provide for complete takeover by Canada of responsibility for these stations.
- Proceed with installation of new upper-air equipment at all sites, and return of present US-owned equipment.
- Proceed with a phased program for replacement of worn motorized vehicles at all sites, and will provide for improving station living quarters and other facilities.

Plans for the forecast services include:

- Improvement in briefing and presentation services at Inuvik and the transmission of ice information between the Arctic and Ice Forecasting Central in Ottawa.
- Increasing frequency of observations to hourly at most major stations in the Arctic Islands.
- Major expansion in weather communications traffic and additional staff at Yellowknife and Resolute for consultation with various government agencies.
- Increasing professional staff at Arctic Weather Office in Edmonton to provide an expanded program of weather forecasts for the Arctic.

A tender has been accepted for the provision of two Lockheed Electra L–188C aircraft on a five-year contract for the Atmospheric Environment Service ice program. These aircraft will be equipped for ice reconnaissance, primarily in support of the Ministry of Transport's Canadian Coast Guard icebreaker fleet. These newer, faster aircraft will increase the efficiency of ice reconnaissance as they are phased into service in 1972, replacing the two Douglas DC–4 aircraft which have been under charter for the past five and a half years.

FISHERIES SERVICE

Resource Development Branch

Responsibilities

- To improve management of the sport and commercial fisheries.
- To co-ordinate federal-provincial programs.
- To develop a thorough knowledge of the water resources of the north so that the impact of future industrial developments can be accurately assessed and evaluated.

Long-term Plans

- Maintenance of the productive capacity of water resources at 1971 levels.
- Inventory of the fishery resource potential of the Northwest Territories.
- Investigation and management of the fisheries of Great Slave and Great Bear lakes.
- Establishment of a comprehensive plan to manage other lakes for sport and commercial fishing.
- Inventory and management of the stream sport fisheries, based primarily upon the Arctic grayling.
- Efficient management of the anadromous Arctic char fisheries of the north coast.
- Development of criteria for protection of aquatic resource from pollution and environmental disturbance.
- Minimizing the adverse effects of industrial development by making recommendations to the developer, enforcing regulations and understanding the resource.

Medium-term Plans

- Compilation of a physical and biological inventory of all the fish-producing streams in the Yukon.
- Development of new fisheries through aquaculture and the harvesting of under-utilized species.

Review of 1971 Operations

- An investigation was begun into the possible effects of proposed pipeline developments upon the aquatic resources of the Mackenzie River valley.
- In connection with the proposed pipeline developments, an inventory of fish resources was begun in the Beaufort Sea drainage and the Porcupine River drainage.
- A study was begun on the effects of mining operations on the aquatic resources of Great Slave Lake.
- Fishery studies on Great Slave Lake were continued, with emphasis placed upon (a) composition of fishermen's catches and location of fishing effort in Management Areas I and IV, and (b) present and potential harvests of under-utilized species.
- A study was begun to evaluate the effect of sport and commercial fishing and on selected lakes and streams, with emphasis on fishing lodge operations.
- A program of surveys was begun to obtain basic information on the fishery potential of selected lakes and river systems.
- A survey was begun on population size, limiting factors, and fish movements in selected populations of migratory arctic char. In 1971 efforts were concentrated in the Pelly Bay area. Results of studies will be used in the establishment of quotas for other char populations.
- Work continued on the catalogue of salmon escapes to the upper Yukon River drainage.
- Thirty thousand rainbow trout fry were released into four lake systems in the Yukon Territory.
- Branch staff played an active role in the work of the newly formed task force on fisheries development in the Northwest Territories.

Plans for 1972

- All active 1971 field programs will be continued in 1972.

- Some expansion of the inventory taking and the Arctic char investigations is anticipated.
- The Task Force on Fisheries Development in the Northwest Territories will conclude its investigations and a report will be published.
- A review of NWT fisheries legislation will begin.
- In co-operation with the industrial development branch, an investigation of alternative harvesting methods for various species of fish to increase both efficiency and selectivity of harvest will begin.
- The effects of commercial, recreational, and subsistence fisheries on stocks of lake trout and whitefish in Yukon lakes will be assessed.
- The development of a winter recreational ice fishery will be encouraged.
- The commercial potential of a burbot long-line fishery will be assessed.
- The potential of pothole fish farming will be investigated.
- A bio-engineering study of Aishihik Lake in connection with a proposed hydro-electric development will be completed.
- A study of the effects of hydro turbines on the downstream movement of migrating Chinook slamon fry at the Whitehorse and Mayo Dams will be undertaken.
- An investigation of the effects of mining operations at Yellowknife and at Great Bear Lake on the aquatic resources will be initiated.
- Studies of the effects of northern geophysical exploration for petroleum deposits on the aquatic resources of the region will begin.

Freshwater Institute

Responsibilities

The investigation of the fresh waters of the Northwest Territories, with emphasis on fisheries and the aquatic environment.

Long-term Plans

- An assessment of the aquatic ecology of the Mackenzie River valley; an investigation of the present ecological factors controlling the diversity and abundance of bottom organisms in rivers; predictions concerning the ecological effect of increased silt loads and oil spills on Mackenzie and Porcupine River valley watersheds.
- Measurement of the productivity of fish stocks in northern waters and the influence of harvesting methods on productivity.
- A limnological survey of the Yellowknife area, with emphasis on the effect of mine wastes (largely arsenic) on aquatic ecosystems. A continuing concern is the limnology of Great Slave Lake and its effect on commercial and sport fishery management.

Review of 1971 Operations

Field studies on the ecological effect of gas-oil pipeline construction and operation began in May. Biologists and chemists sampled about 300 river stations from base camps in Fort Simpson, Norman Wells, Arctic Red River, Inuvik and Old Crow. A field headquarters (office, chemical laboratory, temporary residence) was established in Yellowknife. Major efforts were toward 1) developing methods to sample large rivers; 2) assessing the abundance and species composition of suspended and dissolved materials in these rivers, the present rates of erosion, and silt transport rates.

Research began on fish population of northern lakes to measure the effects of fishing on whitefish stocks with a view to predicting sustainable yields and devising better management methods. Activities this year included (1) setting up a base camp (office, fishery laboratory, residences) in Yellowknife and (2) surveying 11 lakes in the area for suitability in an experimental study. Four of these lakes have now been selected.

A limnological survey of lakes in the Yellowknife area was begun. Bathymetric maps, simple physical and chemical measurements (including arsenic) were begun. Samples of plankton, benthos, and fish were taken and are being analyzed.

Plans for 1972

More detailed studies on bottom organisms and the physical and chemical parameters that control their distribution, growth and reproduction will continue at Fort Simpson, Inuvik, and Old Crow. It is hoped to participate in several experimental studies of watersheds in co-operation with the oil and gas industry and other Department of the Environment agencies. Both laboratory and field studies on the interaction of northern crude oils with bottom organism, at low temperatures and suspended and bottom sediments will be carried out.

Abundance, growth rates, feeding habits, and reproduction of fish stocks, abundance and composition of planktonic and benthic organisms will be measured in the four lakes selected for study of fish populations. Various fishing techniques will be tested for catching live fish for tagging and in preparation for experimental fishing to begin in 1973. Research on arctic char in the Cambridge Bay area will begin in association with the Resource Development Branch of the Fisheries Service.

At Yellowknife, the chemistry of arsenic in lakes in the vicinity will be studied in greater detail.

Conservation and Protection Branch

Responsibilities

- To conserve and protect fishery resources and the environment as a whole.
- To manage the commercial, sport and Indian food fisheries.
- To promote education and maintain communication, with industry, the general public and other government departments, regarding the responsibilities and aims of the Department of the Environment.

Long-Term Plans

- To maintain and develop fish and mammal stocks throughout the north, through the proper use of resources and equipment.

Review of 1971 Operations

- Enforcement of commercial fishery regulations on Great Slave and other lakes within the area of responsibility.
- Surveillance over recreational fishery and enforcement of quotas where applicable.
- Assist in management studies on arctic char and sport-fish for Resource Development Branch.
- Gathering and compilation of statistics for the commercial, sport and domestic fisheries.
- Surveillance of industrial, logging, mining and other land use for environmental protection and clean-up when necessary.
- Surveillance of seismic operations in the Mackenzie valley and offshore areas and in Hudson Bay to ensure compliance with departmental guidelines.

Plans for 1972

- An increase in activities in the eastern Arctic.
- Increasing surveillance of potential land use and pollution problems.
- Increased surveillance and management of fishery harvest in co-operation with Resource Development Branch.

nspection Branch

Responsibilities

- Monitoring and standardizing of plants to ensure regulations are followed.
- Technical assistance in handling, processing, transportation, storage and distribution of fish.
- Lab analysis of domestic and imported products, plant sanitary surveys, and water and ice analyses to ensure regulations are followed.
- Inspection of freshwater species to ensure market acceptance of domestic and imported fish and fish products.

Long-term Plans

- The continued inspection of domestic and imported fish and fish products to maintain standards pertaining to hazardous substances, organoleptic, bacteriological and labeling requirements, and to assist industry in improving processing techniques and product development.
- To complete current surveys aimed at determining what facilities are used for holding and transporting fish, i.e. boats, land vehicles and planes, to improve quality and eliminate rejection due to spoilage of 5 per cent of total fish landings.
- To implement a comprehensive fishing information system to improve the fish trade in Canada through diversifying products and penetrating additional export markets.

Review of 1971 Operations

Annual registration of fish processing establishments in NWT (there are two registered packing plants, one registered cannery, one registered plant for fresh and frozen fish and numerous non-registered packing plants).

Setting up of an adult education program in co-operation with Territorial officials aid primary commercial fishermen in catching, handling, and storing freshwater fish.

- Collection of end-of-line samples, water and ice samples, in-plant sanitary surveys, quality determination, *T. crassus* determinations.
- Setting up training courses at various locations for primary commercial fishermen and industry management personnel.

Plans for 1972

- To begin universal registration of commercial fishing vessels and sport fishing boats as the basis for an integrated licensing and/or royalty collection system.
- To complete analytical surveys on all affected freshwater species for commercially fished waters and imported fish and fishery products.
- To develop grade standards for fresh, frozen, canned, packaged, and cured fish and fishery products to establish baseline data on present quality levels from boats, plants, vehicles and retail outlets.
- To complete field retrieval and computer processing and working data on all facets of quality control including harvesting, transporting, processing, distribution and all hazardous substances and labeling requirements on domestic and imported fish and fishery products.
- To conduct design development and modification studies on present construction equipment and operating requirements of plants within central region.

Fisheries Research Board of Canada

Arctic Biological Station (Ste. Anne de Bellevue, Que)

Responsibilities

Biological investigation of the marine environment in Canada's north, with emphasis on the distribution, abundance and ecology of marine mammals and fishes.

Long-term Plans

Biological assessment of fisheries resources will be continued to provide a basis for the prediction of a maximum sustained yield of marine mammals and fishes. Current emphasis is on the ringed seal in the western Arctic and marine fishes in the Mackenzie area. Marine productivity studies are carried on mainly in the Eskimo Lakes and Liverpool Bay in the Mackenzie area, but work will continue at Frobisher Bay. These studies will provide a basis for future assessment of any undesirable changes in the marine environment.

Review of 1971 Operations

Marine mammals:

A detailed study of the population of the ringed seal was carried out in the Holman Island area. At Herschel Island, near the Alaska-Yukon boundary, ringed seals captured in nets were branded and released in an attempt to learn more about the migratory patterns of the species.

Biological Oceanography:

An investigation began on the marine ecology of the Eskimo Lakes, a series of estuarine waters flowing into the Beaufort Sea east of the mouth of the Mackenzie River. A field site was established at the lakes, and a microbiological and chemical laboratory was set up in the Inuvik Research Laboratory. Preliminary results from the Eskimo Lakes show a wide seasonal water temperature range, almost totally depleted nitrate, low but positive phosphate, and extremely small quantities of chlorophyll in late summer. At the same time of year bacterial counts of 20,000 to 40,000 cells per litre were found at various depths. Primary production was proceeding at a rate of less than 20mg of carbon per m^2 per day in late August. Benthic invertebrates showed a noticeably smaller standing stock in the Eskimo Lakes than had been found by similar methods in Frobisher Bay, Baffin Island. Field investigations were continued at the Lakes in the winter.

The marine ecology study begun in 1967 in upper Frobisher Bay, southeast Baffin Island, was continued in 1971. Selected data were collected, with emphasis on the initiation of a microbiological study and the examination of sea ice for plant and nutrient content. The ice flora was found to include flagellated organisms of a number of taxonomic groups, in addition to the diatoms already known from the ice.

Marine fishes:

A preliminary survey of fish and major benthic invertebrates of the Eskimo Lakes and Liverpool Bay area was first carried out in 1955 with a follow-up resource exploration in 1961. Activities were resumed in 1971 to examine the productive capacity of the marine fishes within the region. Arctic sole is abundant in the area and consists of slow-growing specimens up to 29 years of age. Herring is also common and frequently occurs in large discrete schools. Species of groundfish other than sole are common and one species, native to the Sea of Japan, occurs as a relict possibly of a continuous distribution in hypsithermal times.

Plans for 1972

Study of the ringed seal in the Holman Island area will be completed and a new study begun at Cape Parry. Information on the predation of seals by polar bears will be collected in collaboration with the Canadian Wildlife Service. An attempt will be made to capture and brand large numbers of live ringed seals at Cape Parry. With luck, some light will be thrown on migratory behaviour.

A study of the distribution and ecology of white whales in the Mackenzie delta will be carried out from Tuktoyaktuk.

The marine ecology study in the Eskimo Lakes will be increased, and continued field work is planned for the open water season in Frobisher Bay.

Further information on the distribution, abundance, migratory pattern and age of principal marine species of fish will be gathered from Liverpool Bay. Samples for marine ichthyoplankton composition and distribution in Mackenzie Bay will be collected from the CSS *Parizeau.*

LANDS, FORESTS AND WILDLIFE SERVICE

Lands Directorate

Responsibilities

- To assist in improving the quality, management and use of land.
- To establish a national inventory and data bank of land capability and use.
- To participate in federal-provincial planning for land use.

Long-term Plans

Long-term plans for the Lands Directorate reflect its new association with the Department of the Environment. More emphasis will be placed on studies and plans of land resources in co-operation with other agencies and services.

Review of 1971 Operations

Outdoor Recreation Mapping

The purpose of this project is to identify and classify landscape regions of the Northwest Territories for recreation, considering geological, geomorphological, vegetation and water aspects. Information has been compiled on specific site potential as well. This was part of a larger study called "*Overview of Tourism and Outdoor Recreation in the Northwest Territories*", commissioned by the Northwest Territories Department of Industry and Development.

Plans for 1972

The outdoor recreation mapping project will be applied to the Yukon as part of the ALUR program.

Canadian Forestry Service

Responsibilities

- To conduct forest insect and disease surveys; to prepare forest inventories and maps.
- To prepare advice for the Department of Indian Affairs and Northern Development on forestry operations and practices.
- To conduct ecological research in the north.
- To compile national statistics on forest stocking, growth and depletion and annual fire losses.

Long-term Plans

Owing to the new responsibilities of the Department of the Environment and the increasing pressure of industrial activities, the long-term plans for the Canadian Forestry Service call for increased inventory and mapping services, ecological studies of the impact of land use on the quality of the environment, and research on fire detection and control.

Review of 1971 Operations

Botanical collections were made for preparation of a handbook on the flora of the Boreal Forest, to add specimens to the Canadian Forestry Service herbarium and to study hybridization between jack and lodgepole pine. Routine operations were continued in the forest insect and disease survey and in compilation of national forestry statistics.

A variety of services was performed for the Yukon and Mackenzie forest services. These included advice on establishment of forest tree nurseries and reforestation programs, mapping of vegetation and landform in the proposed Khane National Park, assistance in preparing and implementing operating plans for fire control in the Yukon Territory and in setting up fire detection systems in both the Yukon and Mackenzie territories. The latter included choosing locations for fire towers, setting routes and periods of surveillance for aircraft, and analysing fire statistics for a fire weather index and fire danger rating tables.

Plans for 1972

Work on developing the fire detection and suppression system in the Yukon and Mackenzie territories will continue. Research on fuel hazard rating and fuel mapping will be conducted in the Mackenzie valley. Routine forest insect and disease surveys will continue.

Canadian Wildlife Service

Responsibilities

Surveys and inventories of wildlife resources; conducting research on wildlife species in relation to their habitat; collection and analysis of animal population and utilization data; recommending management procedures for particular species of economic importance; research, management, and administration of migratory birds under the Migratory Brids Convention Act; co-ordination of federal, provincial, and Territorial action on common wildlife problems, including caribou research and management; studies on wildlife disease and pollution.

Long-term Plans

To continue studies of major wildlife resources; to extend research to less-known species; to establish more suitable research facilities in the field; to assess the success of managing wildlife resources to date, and the potential success for the future.

Review of 1971 Operations

Mammalogy Projets

The research project on Dall sheep in the Mackenzie Mountains was continued with more intensive field studies on the biology of the sheep, especially regarding movements. New techniques for the marking of sheep by aerial spraying were tried successfully. The research study in the Mackenzie Mountain area, particularly zones 12 and 19 was expanded to include studies on the woodland caribou, particularly related to movements and to their use by Indians.

The work on bison in the Northwest Territories and in Wood Buffalo National Park was continued, with emphasis on the control of anthrax by vaccination. A small anthrax outbreak in the Northwest Territories occurred during the summer and the animals were destroyed.

Research continued on the nutritional requirements and the physiological characteristics of barren-ground caribou and reindeer. Some new findings by the physiology group indicate why caribou in the wild can subsist on a low protein diet. Methods and techniques are now being developed to test the findings in the field.

Polar bear research continued with tagging and radio tracking to obtain information on movements and life history. An inventory of the bears on the Arctic archipelago was conducted and other populations defined. A new major denning area found in 1970 was being studied.

Studies on the high mortality of the young arctic fox were concluded in the Baker Lake area in co-operation with the University of Saskatchewan, and the final report has been published.

A study of caribou habitat on Southampton Island is being conducted to determine the suitability of the range in anticipation of more stocks being transplanted from Coates Island. The study will also provide an evaluation of Arctic island ecological communities.

Environmental Studies Projects

An environmental studies unit was established. Data on effects of oil exploration and mining activities were collected and preliminary results published. An examination of all the development sites and areas of major ecological significance was conducted, resulting in recommendations for better housekeeping practices and closer adherence to the Territorial Land-use Regulations. Preliminary terrain sensitivity studies of the biotic environment were begun in the Ellesmere Island area.

Ornithology Projects

A survey of breeding areas of greater snow geese in the eastern Arctic was conducted in conjunction with the Quebec Wildlife Service. Banding was carried out at widely dispersed areas on Devon, Axel Heiberg, Baffin, Ellesmere and Bathurst islands. Studies of reproductive physiology of lesser snow geese were begun at McConnell River by the University of Western Ontario. Long-range behavioural and population studies of a small race of Canada geese and lesser snow geese at the same spot were terminated. Studies of the genetics of colour phases of lesser snow geese continued at La Perouse Bay near Churchill, Manitoba, and in the western Arctic studies continued on whistling swans in the Mackenzie delta. Ornithologists spent much of their time watching for possible effects on the ecology from development.

Plans for 1972

Mammalogy

Begun in 1971, a study of the Southampton Island caribou range and Coates Island caribou herd will be concluded in 1972.

Range studies in the northern Saskatchewan area which were initiated in 1971 will continue in 1972.

Studies on the Porcupine herd of caribou, found principally in the Yukon and Alaska, and a preliminary inventory of the Peary caribou on Melville Island, will begin in 1972. The Porcupine herd studies will be co-ordinated by an international committee comprised of representatives of the Alaska government, the Canadian Wildlife Service and the Northwest Territories and Yukon Territory governments.

Polar bear research will continue in two areas. Tagging of the western Arctic polar bear populations will continue, particularly to determine movements in and out of Canadian territory and to make up an inventory of sub-populations in the Arctic archipelago. The second group of studies will centre around Fort Churchill where the radio-tracking and tagging studies have been conducted in the past, with emphasis in 1972 on the study of the major denning area southeast of Fort Churchill.

Preliminary examination of the musk-ox range on Ellesmere Island, begun in 1971, will continue. Further studies on musk-ox will continue on Banks Island in conjuction with the Northwest Territories Game Administration.

The study of the reindeer herd in the reindeer preserve on the Mackenzie delta will be conducted in 1972, and the termination report including recommendations for the continued management of the reindeer herd will be completed.

The Dall sheep and woodland caribou studies in the Mackenzie mountains will continue in 1972.

Studies of bison in the Northwest Territories and in Wood Buffalo National Park will continue with emphasis on disease control.

Environmental Studies Projects

Long-term studies on the effects of oil exploration and mining activities on wildlife and its habitat will continue.

The ecological studies of wildlife habitat in the Mackenzie valley pipeline corridor will be concluded in 1972. This large-scale, intensive study will provide information on ecological constraints relating to construction of a pipeline through the corridor.

The mud environment of the Arctic archipelago will be studied more closely, and ecological constraints on development determined from the research.

An ecological evaluation of new and proposed national parks in the NWT and YT will be continued in conjunction with the National and Historic Parks Branch, Indian Affairs and Northern Development.

Ornithology Projects

An attempt will be made to take a census of colonies of geese on Baffin and Southampton islands using aerial photographs. All other programs in progress in 1971 will continue.

WATER MANAGEMENT SERVICE

Inland Waters Branch

Hydrologic Sciences Division

Responsibilities

To establish a federal research centre to provide leadership in the study of glaciology, snow hydrology, and surface waters; to develop new concepts on the hydrologic processes in the north and to incorporate them into hydrologic models for prediction; to study the structure and properties of snow and ice and their relationships with the environment; to develop computerized data storage systems pertaining to glaciers for federal, provincial, and Territorial water resources agencies, educational institutions and industrial concerns; to co-ordinate a national water inventory; to develop new methods of evaluating and exploiting Canada's inland water resources; to support International Hydrological Decade (IHD) projects.

Long-term Plans

To develop a project that focuses on the hydrologic regime of basins in an environment characterized by permafrost, low temperatures, extensive periods of ice cover, etc. Increased attention will be given to a survey of calving glaciers and the rate at which they produce icebergs. Observations of the Arctic basins selected under the IHD program will continue. Special attention will be given to the hydrologic implications of economic development.

Review of 1971 Operations

Several environmental studies have begun in the Mackenzie River basin to identify and assess the hydrologic implications of northern oil or gas-pipeline development. River scour, ice jams, ice shove, and flood levels at crossings of the main stem and some tributaries of the Mackenzie River were examined. The likely effects of the interaction of groundwater permafrost on the safe construction and operation of pipelines were examined.

Research was also conducted on the effects of water supply, water budget components, and basin hydrology on pipelines, the mechanism of oil spreading on ice and snow surfaces, and the freezing of oil-water emulsions.

Under contract, the Alberta Research Council completed a report on future river studies to be undertaken in the area, and a consulting firm has made a survey of groundwater recharge and discharge areas from aerial photos.

Glaciological studies were continued on Decade Glacier, Baffin Island, and Per Ardua Glacier, Ellesmere Island, under the IHD program. The expanded network to measure strain-rate on the Barnes Ice Cap was resurveyed and additional studies of the calving ice front at Generator Lake were carried out. The Leffert Glacier near Alexandra Fiord, on Ellesmere Island, at the northern end of the North Waters, was selected for detailed investigations of the calving process after a field reconnaissance.

A study of the tidal conditions which prevailed during the winter of 1961–62, when a large part broke off the Ward Hunt Ice Shelf, was completed. In co-operation with the Polar Continental Shelf Project, aerial photographs of many calving glaciers on Ellesmere and Devon Islands were obtained. Special photographs for research purposes were also obtained from other areas.

Work continued on the glacier inventory and the first report on Axel Heiberg Island was published. New studies emphasized the distribution of calving glaciers, and indexes of these were completed for Axel Heiberg, Devon, Bylot, and Baffin islands. The islands have respectively 4, 69, 3 and 138 glaciers that reach tidewater.

Plans for 1972

Hydrologic research will be extended and intensified along proposed pipeline routes through the Yukon to the Alaskan border. A plan to map the distribution of icings (aufeis) will be initiated, studies in three research basins continued, seasonal changes in the Mackenzie delta flow examined, and documentation of an extreme summer storm in the lower Mackenzie basin concluded. Groundwater investigations will be continued and expanded.

The mass balance investigations on the IHD basins will continue during the summer, as will work on the glacier inventory.

A contract for the initial phase of the glacier inventory of the St. Elias Range, Yukon Territory, has been signed with the Arctic Institute of North America. Studies of the calving process will be made at the snout of Leffert Glacier between May and August 1972, and photogrammetric studies of ice discharge from selected calving glaciers will continue.

In January 1972, a representative from the Glaciology Subdivision participated in an oil-spill test off the coast of Alaska arranged by the US Coast Guard.

A team will participate in the ground-truth aspect of the remote-sensing program during the Arctic Ice Dynamics Joint Experiment (AIDJEX). Further remote-sensing studies will be made in the Mackenzie delta area.

Water Quality Division

Responsibilities

- Operation of the water quality network in the Yukon Territory and the Northwest Territories, comprising 55 water sampling stations on surface waters. The objectives of the network are: to obtain base-line water quality data for industrial, municipal, and private use and to set water quality standards; to study water quality trends with a view to designing methods or models for forecasting water quality conditions; and to support IHD activities in Canada and the world.
- Support of special projects carried out by the Department of Indian Affairs and Northern Development which conducted a pollution surveillance to assess the effect of mine waste-waters on public streams in the north; the Mackenzie River pipeline study; the Alberta Research Council and the University of Calgary, which examined the relation of water quality in the Mackenzie River basin to the surrounding geological formation; the Fisheries Research Board of Canada, which studies water quality data for research on Mackenzie River; the Fisheries Service and Fisheries Management of the Mackenzie basin, which examined water quality for fisheries program; and the Fisheries Services, which investigated pollution caused by trace metal at Pine Point, NWT.

Long-term Plans

To expand the network of water sampling stations to 130 by the end of the 1973-74 fiscal year.

Review of 1971 Operations

A total of 1,096 water samples were analysed for various projects. The particular projects and the number of samples analysed for each project were:

- Department of Indian Affairs and Northern Development: 43. Samples are regularly collected under DIAND direction from 26 water quality stations and analysed for a pollution surveillance program.
- Mackenzie River Pipeline Study: nine. Twenty-two stations have been established and the first round of sampling has been completed.
- Alberta Research Council and University of Calgary: 230. Joint water quality study.
- Fisheries Research Board of Canada: 19. Water quality data for Mackenzie River.
- Fisheries Service: 286. Fisheries Management of the Mackenzie basin.
- Fisheries Service: 168. Investigation of trace metal pollution at Pine Point, NWT. This division, in co-operation with the Fisheries Service, investigated the pollution potential of the Pine Point Mines by carrying out on-ground survey and the analysis of water samples. Also 36 samples were analysed for Laval University (ALUR) which was investigating certain aspects of the Pine Point pollution problem.
- IHD Program: 305. A report on IHD activities is being prepared in co-operation with other participating agencies.

All data are stored on magnetic tape and are available on request.

Plans for 1972

Plans are under way to expand the network by about 25 water sampling stations.

A trailer equipped as an analytical laboratory is nearing completion at Calgary and will be transported to Hay River in the near future. Plans for a laboratory at Yellowknife are still under consideration, but may have to be delayed until 1974.

The division will continue to co-operate with Fisheries Services in the Mackenzie River corridor study to assess the possible effects of oil pipelines on the environment of the north. It is expected that about 500 water samples will be collected and analysed from 22 water sampling stations on the Mackenzie River.

Water Survey of Canada

Responsibilities

The Water Survey of Canada (WSC) is primarily responsible for the collection, computation, and publication of surface water data, including sediment data, for most of Canada. The division works in co-operation with provincial governments and other departments of the federal government. In addition to operating a network of hydrometric gauging stations, the WSC co-operates with other divisions of the Inland Waters Branch in the collection of water samples for quality analysis and the operation of observation wells for groundwater studies. It also constructs, operates, and maintains water level recording stations to provide information on tides and water levels for the Marine Sciences Branch. Studies are run in hydrology and hydraulics and in instrument development and procedural methodology, operation of a calibration facility for the rating of instrumentation used in its work, and operation of laboratories for the analysis of sediment samples.

Long-term Plans

Co-operation and consultation with the Department of Indian Affairs and Northern Development and the various engineering studies of the changes required in the hydrometric network will assist in planning of future water resource surveys in the Territories. The WSC, through arrangements with the Marine Sciences Branch and other divisions of Inland Waters Branch, will continue to observe water levels for tidal and navigational purposes, water quality and groundwater levels.

Review of 1971 Operations

In addition to its regular work in the Northwest and Yukon Territories, the WSC co-operated with several other government agencies in an intensive study of the Mackenzie River valley, to measure possible detrimental effects on the environment if oil and gas pipelines are constructed in it. The WSC constructed 10 new gauging stations, began to train six technicians, and placed orders for equipment, including two catamarans for river survey.

Thirty-four hydrometric gauging stations were operated in the Yukon Territory and 55 in the Northwest Territories; tides and water levels were recorded at the additional 13 stations. Sediment observations were made at one station and water quality samples were collected at approximately 50. Snow surveys were made for the tenth year at 11 locations to assist the prediction of seasonal run-off, particularly in the Taltson River basin where hydro-electric power is generated. A plan for consultant network planning is based on considerations discussed in a recent report by WSC, and in an ultimate plan for the network, which may not necessarily be fully established.

Plans for 1972

Plans include making sediment surveys at nine stations along the Mackenzie River and its tributaries. A sediment laboratory will be established at Hay River. A sub-office will be in operation in Inuvik, and during the summer personnel will be housed in trailers at Fort Simpson, Norman Wells, Wrigley, and Arctic Red River.

Water Planning and Operations Branch

Responsibilities

To co-operate in the development of programs to manage northern island and coastal waters, and to improve the quality of the northern environment in accordance with the Canada Water Act.

Long-term Plans

Consideration of river basin planning in the north under consultative committees established by the Canada Water Act.

Review of 1971 Operations

A study of flood risks in a proposed southern expansion area of Hay River, Northwest Territories, was carried out by the engineering division of the branch at the request of the Central Mortgage and Housing Corporation. Based on the findings of office investigations in Ottawa and supported by field investigations by the branch's western region engineering unit, it was recommended that no housing development be approved in certain low-lying sections of the proposed expansion area. The study revealed that land protected from flooding by highway and railroad embankments, and suitable for future community development, lay west of the proposed expansion area.

Plans for 1972

- Co-ordination of responsibilities under the Northern Water Programs Sub-Committee of the Interdepartmental Committee on Water.
- Development of water resources management plans for major northern rivers in co-operation with Territorial and provincial governments:

(a) Planning leading to the development of a water resource plan for the Mackenzie basin in co-operation with the Canada-Northwest Territories Consultative Committee and relevant Canada-provincial consultative committees.

(b) Planning for northern water resource management through the Canada-Yukon Consultative Committee established under the Canada Water Act.

Marine Sciences Branch

Responsibilities

- To carry out hydrographic and oceanographic surveys and studies in Arctic waters. To produce and distribute charts, sailing directions, tide tables, and reports based on survey activities and other sources.
- To carry out physical and chemical studies of the Arctic marine environment to determine the circulation, wave regimes, tidal characteristics, properties and distribution of ice; and to develop mathematical simulation models on the behaviour and movements of ice and pollutants in the Arctic archipelago.

Long-term Plans

To complete standard hydrographic surveys of the Arctic coasts as soon as possible and to continue the publication and maintenance of up-to-date charts on the region. To carry out reconnaissance surveys when it is necessary to chart ahead of the regular survey. To maintain reliable sailing directions as published in the *Pilot of Arctic Canada*. To publish tide tables to meet the needs of northern navigation and to carry out research to enhance our knowledge of tides in northern waters.

To gather and interpret chemical and physical oceanographic data for a study of the environmental conditions and properties and the dynamic processes that effect the distribution of potential pollutants; and the advection and mixing of Arctic waters.

Review of 1971 Operations

In 1971 a large part of the resources of the Canadian Hydrographic Service was assigned to northern survey operations.

- From February to April hydrographers seconded to the Polar Continental Shelf Project completed a survey of the offshore areas of the Beaufort Sea. This group, supported by helicopters and equipped with special echo sounders for sounding through ice, was part of a multidisciplinary group of four Canadian and five American parties comprising the Arctic Ice Dynamics Joint Experiment (AIDJEX). Canadian activities consisted of bathymetric, gravity, wildlife, and air-ice interface observations conducted by members of the Canadian Hydrographic Service; Gravity Division, Earth Physics Branch, Department of Energy, Mines and Resources; Canadian Wildlife Service; and the Atlantic Oceanographic Laboratory respectively. AIDJEX consisted of a pilot study of instrumentation under Arctic conditions by the various groups, the most sophiticated being the array of air-ice and ice-sea sensors of the Naval Arctic Research Laboratory for the measurement of parameters in these regions.

- The hydrographers moved to Alert upon completion of the Beaufort Sea project and made bathymetric observations in the Wrangel Bay area of Robeson Channel in support of Defence Research studies. In addition, horizontal control was established in the vicinity of Hans Island.

- CSS *Parizeau*, based in Victoria, BC, reached her survey area in the Western Arctic in mid-July and continued systematic charting of the inshore areas of the Beaufort Sea. The 1971 survey extended eastward from Mackenzie Bay, linking up previous years' surveys with those of CSS *Baffin* which had also operated in the western Arctic in 1970. In all, *Parizeau* sounded over 11,000 nautical miles.

- On the Mackenzie River, a chartered vessel manned by staff from the Pacific Region sounded between Norman Wells and Fort Good Hope, making detailed surveys in the Ramparts area. Reconnaissance work was also done in several delta channels.

Atlantic Region hydrographers joined two Ministry of Transport icebreakers, CCGS *Labrador* and CCGS *John A. Macdonald* in early summer.

- CCGS *Labrador* continued surveys in the Viscount Melville Sound area of the Northwest Passage, and CCGS *John A. Macdonald*, which was on eastern Arctic patrol, surveyed the approaches to Deception Bay and did detailed reconnaissance work in Wellington Channel. *John A. Macdonald* also obtained track soundings in sparsely charted areas such as Jones Sound, Norwegian Bay, Greely Fiord, d'Iberville Fiord and Tanguary Fiord. A total of 13,350 nautical miles of reconnaissance and tract soundings was collected.

- In 1971 the first editions of 10 Arctic charts and 14 strip charts of the Mackenzie River were released. These charts were in metric format.

- A scientist from the Division of Oceanographic Research continued the ice-pressure observation program, with observations taken in Viscount Melville Sound and Norwegian Bay in August 1971.

- The CSS *Hudson*, based in Dartmouth, NS, was used by the Department of Energy, Mines and Resources as support for a marine geophysics project in the area of the Labrador Sea, northern Hudson Bay, Davis Strait and Baffin Bay. The project lasted nine weeks, with six weeks spent in Baffin Bay. In addition, the CSS *Dawson*, also based at Dartmouth, supported a DEMR marine geology project during August. The area of operation was the southern coast of Baffin Island from Davis Strait to Hudson Strait.

The Frozen Sea Research Group conducted field operations in the vicinity of Greely Fiord.

- Measurements were made of currents immediately below the growing sea ice sheet and of oceanographic conditions along the length of the fiord. Some time series for the tidal cycle were obtained. Tongues of water enter at various levels in the fiord.

- Some preliminary experiments were conducted on the freezing point of sea water to ascertain whether water immediately below the growing ice sheet, where the ratio of ion concentrations might be altered by the freezing process, would have the same freezing point-electrical conductivity as "normal" sea water.

- During August, in Cambridge Bay, a series of field operations was initiated to study seasonal variations in water structure associated with growth and decay of sea ice.

  The precise measurement of salinity and temperature should make possible a better selection among models proposed for vertical mixing associated with salt rejection by sea ice during growth.

- Some studies of runoff in Arctic regions have been completed to study seasonal changes in the surface waters.

Plans for 1972

In 1972 CSS *Parizeau* will again undertake extensive sounding operations in the Beaufort Sea. Upon completion of this project *Parizeau* will be used by personnel from the Geological Survey of Canada for marine geology studies in the Beaufort Sea area. Pacific region personnel, using a chartered ship, will continue surveys on the Mackenzie River. Polar Continental Shelf Project hydrographic staff will establish extensive horizontal control in Robeson Channel, Norwegian Bay and Viscount Melville Sound. This control is being established in anticipation of future sounding operations. On the Robeson Channel project, the hydrographers of the Canadian Hydrographic Service will be joined by staff from the Danish Hydrographic Office and the Danish Geodetic Institute.

In the eastern Arctic, it is hoped to employ two Ministry of Transport icebreakers for survey operations.

In the Northwest Passage, charting of Viscount Melville Sound will continue and detailed surveys are to be made of the approaches to Little Cornwallis Island. In addition, it is hoped that more reconnaissance surveys will be conducted in Jones Sound and the numerous fiords in its vicinity.

A member of the scientific staff of the Division of Oceanographic Research has been appointed principal investigator on three icebreaker probes to assess the feasibility of extending the navigation season in Goose Bay, Labrador. Probes will be made in January, March and May of 1972.

The Frozen Sea Research Group is in the last stages of developing an under-ice traversing probe to record horizontal variations in temperature and salinity beneath growing sea ice. In the laboratory a series of experiments in which sea water and fresh water are cooled and heated to create and melt ice have indicated anomalous behaviour near the freezing point. This is being studied. Work has begun on measuring change in the freezing point of sea water under pressure.

The group is also working with the Hydrographic Service to develop a tide gauge.

ENVIRONMENTAL PROTECTION SERVICE

Air Pollution Control Directorate

Responsibilities

- To exercise responsibility under the recently proclaimed federal Clean Air Act, Section 10–18, for all activities involving federal works, businesses and undertakings in the Northwest Territories and Yukon Territory.
- To exercise responsibility under this Act for public safety regarding air pollutants that might be a significant danger to health.

Long-term Plans

Long-term plans include the staffing of EPS district offices in the north with air pollution control engineers and technicians to take action in accordance with the Clean Air Act.

Review of 1971 Operations

In 1971 an inventory of emission sources in Canada, including the two Territories, was begun. Attention was focused on the assessment of air pollution from federal facilities and installations, and pollution associated with proposed pipelines in the north.

Plans for 1972

To intensify operations begun in 1971, with possible completion of the inventory of emission sources.

An investigation of arsenic air emissions from Yellowknife gold smelting operations is anticipated.

Ecological Protection Branch

Responsibilities

- To co-ordinate the activities of separate missions in assessing the ecological impact of industrial exploitation of resources.
- To study separate mission assessments and the result of their effects on one another.
- To make available information which will help authorities make decisions based on professional expertise.
- To assess the ecological effects of the activities of government and private industry.

Long-term Plans

- Surveillance of artificial island construction at two places in the Mackenzie Bay, Beaufort Sea, by Imperial Oil Enterprises Limited.
- Ensuring that standards recommended for the protection of the environment are complied with.
- Estimating and forecasting of the ecological impact of multiple island construction using data obtained during current construction.
- Assessing the potential impact of future activities related to this. If artificial island construction is successful and subsequent drilling operations reveal important hydrocarbon resources, storage and transportation facilities will be required.
- Acquiring base-line data for comparison of pre- and post-construction periods.

Review of 1971 Operations

The effect of artificial island construction in the Mackenzie Bay was assessed by all missions having an interest in this activity. A report was made to a designated authority, together with appropriate recommendations for a final decision and follow-up action.

Plans for 1972

Assuming that island construction proceeds: surveillance of construction activities to ensure standards and limitations are met; assessment of the impact on ecology; collection of base-line data.

On completion of the island construction phase: assessment and estimation of the ecological consequences of multiple island construction and further resource exploitation, if applicable.

Federal Activities Branch

Responsibilities

- To exercise primary responsibility for control and abatement of pollution from the operation of federal facilities, including government departments, Crown corporations, and Crown agencies.
- To provide advisory service on environmental engineering to other federal departments, agencies, and Crown corporations.
- To provide technical advice about the environment to the governments of the Northwest Territories and the Yukon Territory.
- To provide a consultation service on environmental conditions to the Medical Services Branch of the Department of National Health and Welfare.
- To establish and maintain communications with the officials and agencies of the two Territorial governments, other federal departments, agencies and Crown corporations that the branch deals with.
- To function as health officer for the Northwest Territories through appointment by the Territorial government.

Long-term Plans

Long-term plans are designed to eliminate all sources of pollution from the operation of federal facilities and activities.

Within the limits of available resources, efforts will be made to raise the standard of sanitation in federal establishments and northern communities to a level as close as possible to those found in the south.

In time, the Federal Activities Branch will end the advisory and consultation services held over from its previous association with the Department of National Health and Welfare.

Monitoring of the quality of water supplies, waste disposal and treatment systems will be continued and extended to cover all federal activities and communities, as resources permit.

Review of 1971 Operations

In 1971 much of the branch's activities in the north were directed toward the control and abatement of pollution from federal facilities, through assessment and evaluation of existing waste treatment facilities, and by a review of plans for proposed systems or improvement of existing ones.

The inventory of waste treatment facilities for federal activities was continued and the inventory of all waste treatment facilities serving the Department of the Environment was completed.

A number of requests by other departments for advice or assistance on water supplies and waste disposal were answered, as were several requests by Medical Services Branch for assistance with environmental problems in a number of northern communities. Medical Services Branch was assisted in carrying out sanitary surveys for nearly every settlement and establishment in the Keewatin District.

This branch continued, through its regional offices and laboratory facilities at Winnipeg, Edmonton and Vancouver, to

provide monitoring services for community water supplies, waste treatment and disposal systems.

The branch also participated in the development of environmental guidelines for pipeline construction through the Mackenzie Valley and provided technical advice and assistance to the Yukon Water Board.

Plans for 1972

Increased field activities, including monitoring, evaluation and plan approvals for water and waste systems, and remedial action to protect the environment.

The inventory of federal facilities and assessment of the pollution control works serving them will be completed.

Continued efforts will be made to improve environmental conditions and standards of sanitation at federal government establishments and other communities in the north.

Requested surveys of environmental conditions at some DEW line sites will also be carried out.

The branch will continue to provide technical advice and assistance on all aspects of the environment and sanitation to other federal departments, agencies, Crown corporations and the Territorial government.

Water Pollution Control Directorate

Responsibilities

- To co-ordinate EPS programs with the Department of Indian Affairs and Northern Development and the two Territorial Water Boards, and to implement water quality programs in the north.
- To carry out water quality management projects under the Canada Water Act.
- To implement water pollution abatement programs, including those covered by national effluent regulations under the amended Fisheries Act.

Metal Mining Industries

Long-term Plans

A biological and engineering survey of four mine sites in the Northwest Territories is planned for this summer. In 1972 the directorate will also conduct an inventory of mining operations and pollution levels in the Yukon Territory, and begin negotiations with mines for pollution abatement in the Northwest Territories.

By 1973 the directorate hopes to complete its biological and engineering survey of the mines in the Northwest Territories, and begin one on mines in the Yukon Territory. A base-line survey will be conducted on the site of the new mine on the Nahanni River, and waste treatment plans and specifications will be reviewed and approved with other federal department missions in the two Northern Territories. Negotiations with mines in the Northwest Territories on pollution treatment will be concluded.

By the fall of 1974 the directorate also hopes to receive assurance from all mines in the Northwest Territory that effective anti-pollution will be in operation.

Future plans also include the inspection of all waste treatment facilities under construction, completion of the investigation of mines in the Yukon Territory, and the beginning of a regular monitoring of mine effluents.

Review of 1971 Operations

In co-operation with Laval University in Quebec City, a biological and engineering survey of Pine Point Mines, Northwest Territories was conducted.

Negotiations on pollution were conducted with Echo Bay Mines in the Northwest Territories.

Plans for 1972

Plans for 1972 are outlined under long-term plans.

Oil and Gas Wells

Long-term Plans

The directorate is interested in identifying pollutants and their effects on receiving water, and in negotiating with industry for a common plan of action for the clean-up and preservation of the environment. Its objectives include preventing pollution from well-process materials entering water.

Plans to meet the objectives are: to conduct surveys on the extent of pollution, to inspect well sites, examine waste effluents and the treatment and process conditions under which they are produced, to evaluate the effect of wastes on the receiving water, to conduct toxicity tests on drilling chemicals and muds, to consult with EPS headquarters in establishing at the federal level effective effluent regulations for well operations, to demonstrate the best treatment technology and methods, to advise industry on suitable treatment methods, to monitor well sites, and to persuade companies to recover and re-use waste materials.

Due to the large number of wells, the number of individual companies involved and resources to be protected, and the complexity of and lack of knowledge about the problems involved, it would be unrealistic to schedule precise target dates for carrying out these measures. However, with sufficient resources, manpower and co-operation an objective of 1980 might be possible.

Review of 1971 Operations

There were virtually no projects in 1971.

Plans for 1972

Plans for 1972 are in accordance with long-term plans.

Basin Studies

Long-term Plans

The objectives of this directorate are to determine the number of pollution sources, and the effects of pollutants on the basins to be studied. The studies conducted in co-operation with the Fisheries Research Board in the Mackenzie basin will be continued, and might be finished by 1974. The directorate also plans to conduct a survey of pollution sources on the Mackenzie River and delta. Negotiations will be held with towns and industries along the river to curb their discharges of waste.

After 1974 the directorate might conduct basin studies on sources of pollution on the Great Slave Lake.

Review of 1971 Operations

The directorate provides resources for pollution abatement plans, and for federal, provincial, and international agreements on major and minor basin studies in a region. In co-operation with the Fisheries Research Board, biological and limnological studies were conducted on the Mackenzie River basin.

Plans for 1972

Plans for 1972 are outlined under long-term plans.

POLICY, PLANNING AND RESEARCH SERVICE

Responsibilities

To develop, evaluate and co-ordinate strategies, policies and programs for improving Canada's environment and related renewable resources.

Long-term Plans

To fulfil the above responsibilities as they pertain to departmental undertakings in the north.

Review of 1971 Operations

- Co-ordination of federal participation in the activities of the Intergovernmental Steering Committee on Northern Development of the Canadian Council of Resource and Environment Ministers.
- Co-ordination of the Department of the Environment's representation and participation in the Advisory Committee on Northern Development.
- Co-ordination of the review and evaluation of northern waters and related resource programs.
- Establishment of consultation committees for the Yukon and Northwest Territories for Territorial-federal consideration of environmental problems. Present emphasis is on the Mackenzie River basin.
- Appraising and advising on the effects of northern development of gas and oil.
- Interdepartmental consultations and drafting of regulations pertaining to legislation and amendments to the Northern Inland Waters Act, Territorial Lands Act, Canada Shipping Act, and the Arctic Waters Pollution Prevention Act.
- Co-ordination of activities for the protection and enhancement the quality of the northern environment.

Plans for 1972

To continue to fulfil the responsibilities listed above.

MACKENZIE VALLEY PIPELINE CORRIDOR STUDIES

Environmental studies are being conducted in a corridor extending from the area of Fort Simpson to the area of Fort McPherson. Branches will extend from Fort McPherson westward through the Porcupine drainage area, northward along the west side of the Mackenzie delta, and from there westward along the Yukon Arctic coastline.

Projects and agencies of the department involved in this program are the following:

Atmospheric Environment Service

Project:

Mackenzie River Valley-Beaufort Sea climatological study

Objective:

To prepare a comprehensive and intensive regional climatology for the Mackenzie River valley-Beaufort Sea area to meet the needs of government and industry for high priority activities in the Arctic.

Work Done 1971:

Studies have been completed on climatic controls, energy balance, dynamics of weather systems and analysis of the temperature regime.

Plans for 1972:

Completion of the climatological study is planned for June 1972, with publication by December 1972.

Fisheries Service

Project:

Mackenzie-Porcupine River aquatic ecology related to gas and oil pipeline development

Objectives:

- To assess the distribution, abundance and diversity of aquatic organisms (primarily zoobenthos) that occur in regions subject to future development.
- To assess the range of natural variation in physical and chemical parameters that influence the growth of the aquatic organisms mentioned above.
- To assess the effects of increased silt loads on the aquatic ecology of rivers and streams.

Work Done 1971:

Assessment studies were carried out along the Mackenzie River from Great Slave Lake to the delta, and on the Porcupine River-North Slope watersheds.

Plans for 1972:

To continue studies on the effects of increased silt and to conduct experiments on the effects of crude oil on small streams and lakes. The project will be concentrated in small areas around Fort Simpson, Inuvik and Old Crow.

Project:

Fish resources of the Mackenzie River valley

Objectives:

- To obtain further information on the distribution, abundance and life history of fish.
- To complete an inventory of fishery resources in the area so that the impact of future industrial developments can be accurately assessed and evaluated.

Work Done 1971:

Studies were continued to determine species composition, distribution, diet, age, growth and age class composition. Spawning, nursery and feeding areas for various species were delineated. Work on the fishery resource inventory was continued.

Plans for 1972:

Further delineation of spawning, nursery and feeding areas; improved determination of migration routes and times; verification of population estimates; laboratory bio-assay experiments investigating effects of pipeline flushing chemicals on fish; and field experiments simulating stream disruptions at pipeline crossings will be carried out. The fishery resource inventory will be expanded.

Lands, Forests and Wildlife Service

Project:

Mapping of wildlife habitat and animal concentrations in the Mackenzie valley and delta

Objectives:

To produce maps of 1:250,000 scale showing habitat class for wildlife graded by quality. Separate habitat maps will be prepared for moose; muskrat and beaver; waterfowl and shorebirds; arctic fox, bears, barren ground caribou and Dall sheep.

Work Done 1971:

Preliminary maps compiled.

Plans for 1972:

Completion of the project.

Project:

Mackenzie Valley terrain sensitivity studies

Objectives:

- To determine the relationships between landform, vegetation cover and permafrost in sub-Arctic and alpine environments.
- To map landform-potential vegetation types.
- To determine (i) the reactions of arctic and sub-arctic vegetation and soil to

various disturbances, and (ii) techniques contributing to the maintenance and restoration of surface stability.

- To integrate this work with results of studies of the Geological Survey of Canada, Canadian Forestry Service, Canadian Wildlife Service, ALUR projects and others to devise a terrain sensitivity classification for land use regulations.

Work Done 1971:
Approximately 20,000 square miles were mapped in the southern Mackenzie River valley, and 25,000 square miles in the northern part of the valley, in co-operation with the Geological Survey of Canada.

Plans for 1972:
Reconnaissance survey and mapping will continue.

Project:
Vegetation mapping of the Mackenzie valley transportation corridor

Objectives:
To produce maps at a scale of 1:125,000 that will provide basic information necessary to:
- appraise the sensitivity of the environment to disturbance,
- assess wildlife habitats,
- assess the productivity and commercial value of the lands for forestry and recreational purposes.

Work Done 1971:
Reconnaissance to allow interpreters to study the vegetation and collect data for a classification system.

Plans for 1972:
Interpretation and mapping program will continue.

Project:
Land use information map series

Objectives:
The production of a series of 44 land use information maps integrating a variety of data on renewable resources and related human activities, as part of the information that will be used to:
- facilitate the administration of the Territorial Land Use Regulations
- meet other requirements for regional planning, land use planning and land management programs in the north.

(The series will provide information for use in the pipeline evaluation studies.)

Work Done 1971:
Data collection has been completed for more than 30 maps, and is 90 per cent complete for the remainder. Twelve complete sheets have been assembled and are in the drafting stage and several additional sheets are partly assembled.

Plans for 1972:
Completion of project.

Water Management Service

Project:
Collection of water level, discharge and sediment load data

Objectives:
- To provide data for navigation charts and remedial dredging, to indicate speed of change and shoreline fluctuation.
- To facilitate forecasts of water levels and discharges and the extent of seasonal variations.
- To determine present water levels and the sediment content for comparison both during and after completion of any major construction.

Work Done 1971:
Installed six continuous water level recording stations on the Mackenzie River, two on tributaries and one on the Firth River tributary to the Beaufort Sea. Ordered two new river survey catamarans.

Plans for 1972:
- continue operating all hydrometric stations
- begin sediment surveying at nine sites
- establish a three-man sub-office at Inuvik.
- establish a sediment analysis laboratory at Hay River
- install radio telemetry equipment at Norman Wells and Fort Simpson to transmit water level information via the ERTS "A" satellite
- participate in surveys to determine the distribution of flows and sediments in the Mackenzie River delta
- assist in the collection of water quality samples

Project:
Water quality studies

Objectives:
- To determine the present water quality on the Mackenzie River and its major tributaries.
- To monitor water quality variations in the Mackenzie River system that occur during the construction of pipeline, road, rail, and urban facilities in the corridor.
- To provide water quality information to other agencies involved in environmental studies.

Work Done 1971:
Field sampling and analysis

Plans for 1972:
Establishment of a field laboratory in the Northwest Territories and continuation of the sampling and analysis program.

Project:
Hydrologic implications of northern pipelines

Objectives:
- To identify and assess hydrologic factors affecting or interacting with pipelines at river crossings.
- To identify and assess hydrological problems caused by pipeline development in drainage basins.
- To examine the physical limnology of a selected number of lakes along proposed pipeline routes.
- To evaluate groundwater and permafrost conditions in the Mackenzie River valley region and to establish the probable effects of groundwater-permafrost interactions on the construction and safe operation of a pipeline.

Work Done 1971:
Data gathered on Mackenzie ice shove and ice jams; air photo interpretation of fluvial geomorphology on the lower reaches of Mackenzie River; documentation of an extreme storm condition, July 1970 (almost completed); hydrogeological reconnaissance and interpretation of aerial photographs of Mackenzie River valley region (in progress); limited drilling at Norman Wells and Inuvik (completed); and instrumentation installed for study of coupled heat transfer in permafrost regions.

Plans for 1972:
Project to continue

Environmental Protection Service

Project:
Waste disposal study

Objectives:

- To make recommendations about waste disposal regulations
- To demonstrate, if necessary, by research and development that the recommended standards can be met.

Work Done 1971:

Solid waste disposal regulations.

Collection of background material; investigation of incineration and air pollution; investigation of residual ash disposal.

Waste disposal regulations and guidelines.

Collection of information on sewage treatment in the Arctic and sub-Arctic and proposal of alternatives.

Plans for 1972:

To develop regulations and standards; to continue technical studies for the development of treatment guidelines.

DEPARTMENT OF EXTERNAL AFFAIRS

SCIENTIFIC RELATIONS AND ENVIRONMENTAL PROBLEMS DIVISION (ECS)

The Department of External Affairs is concerned with activities in the north conducted on behalf of or in co-operation with foreign governments or their agencies, including scientific or other projects, both civil and military. External Affairs is responsible for consulting with other departments about official applications for foreign scientists and explorers to carry out research in the Arctic, as well as clearances to foreign vessels intending to engage in scientific research or exploration in Arctic waters. As a member of the Advisory Committee on Northern Development, the Sub-Committee on Arctic Research and other sub-committees, the department provides advice on matters having foreign policy implications and also has a responsibility in the negotiation of agreements with other countries arising out of activities in the Arctic. Similarly, the department has an advisory, co-ordinating and operational role in matters of international law and policy arising out of use of the waters adjacent to the Canadian Arctic islands including, in particular, navigation and pollution control as well as the exploration and exploitation of the off-shore resources under these waters.

The department also has a co-ordinating role in the field of Soviet-Canadian scientific co-operation in the Arctic. When the Minister of Indian Affairs and Northern Development visited the USSR in July 1971, it was agreed to examine the Soviet suggestion for the expansion of bilateral contacts in Arctic science. It was then proposed that a joint Canada-USSR body be set up to investigate the possibility of scientific co-operation in the Arctic, and that this body be governed by the General Exchanges Agreement, signed during the visit of Premier A.N. Kosygin to Ottawa on 20 October 1971. The terms of reference of this body are still under discussion.

The Science and Technology Sub-Committee of the Advisory Committee on Northern Development was made responsible for formulating the terms of reference and membership of the Ad Hoc Canadian Committee on Arctic Science and identified the areas in which we are particularly interested. (As a result of these developments, a team of scientists visited the Soviet Union in early 1972).

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT

INDIAN AND ESKIMO AFFAIRS PROGRAM

YUKON REGION

Responsibilities — General

At the beginning of the new fiscal year on April 1, 1971, the old Yukon Agency became a region with headquarters in Whitehorse and a regional director responsible to Ottawa for all programs.

Three programs are covered by Indian and Eskimo Affairs:

- Community affairs,
- Education (adult education, vocational, employment-relocation), and
- Economic development.

Community Affairs Branch

Responsibilities

To administer those sections of the Indian Act that have general application to all Indians, and in particular those section that apply to Indian Reserves. With no reserves in the Yukon at present, the applicable sections of the Act are those referring to membership, band councils, management of Indian moneys, estates and other related matters.

The Social Assiatance Program is the full responsibility of this branch and three field officers cover the Yukon Region. Social assistance is administered under the same regulations and on the same scale as applies to all residents of the Yukon.

At present, the Child Care Program is administered by the Yukon Department of Health and Welfare and is applied under the regulations for the Territory. All costs of child care for registered Indians is charged back to the Indian and Eskimo Affairs Branch.

Review of 1971 Operations

This Branch participates in two types of housing program for registered Indians: the Off-Reserve Housing Program for persons who are gainfully employed and who wish to move into established communities; and the Subsidy Housing Program where the branch constructs homes on lands set aside for Indian use and then transfers the home to the Indian family designated by their councils. The larger program in 1971 was the Subsidy Program, with 23 homes being constructed and many repair programs undertaken.

A new program for improved water and sanitation services was implemented, with the branch sharing in the costs of one settlement sewer and water system and the construction of four large washhouse-laundromat complexes within the region.

The Grants to Bands Program was expanded to include all bands in the Yukon. For 1971 these allocations, were, in fact, organization grants to allow each band to hire staff, set up an office and gain experience with a view to taking over branch programs at an early date. Organization has been reasonably well developed and during 1972, bands will be taking on programs.

Total community physical planning is being developed in each settlement and the bands are being encouraged to express their community needs and formulate plans to meet their objectives. Each band has a band staff in addition to a band council and this organization is being used to bring programs to the people as well as to obtain program ideas from the people.

The Yukon Native Brotherhood has been very active and has a number of projects under way with the Field Worker Program helping to provide a link at the band level between the Yukon regional staff, band staff and the brotherhood staff.

The Yukon Native Brotherhood have received three grants from the Indian and Eskimo Affairs Branch in addition to the regular grants for brotherhood activities. This money is being spent on programs designed for the promotion of Indian activities or development within the Yukon.

- Community development $50,000
- Tlingit-Haida claims 25,250
- Band consultations 17,000

The Community Development Program for the Yukon was taken over by the Yukon Native Brotherhood at the end of June and became active during the late fall. It is being expanded and as funds permit, will be active in a number of Yukon settlements.

The Yukon Native Brotherhood has a field worker program and these workers are co-ordinating their efforts with the band managers and the department of field officers. Such co-ordination should make more services available to all Indian bands while adding to the source of information on all types of programs and projects that can be of benefit to Indian groups.

Plans for 1972

In the Community Affairs Branch more emphasis is being placed on self-government for all bands within the Yukon region. With the organization of band staff well advanced in 1971, the take-over of much local administration at the band level is anticipated during 1972. Many bands have shown a positive approach to the development of their own villages or communities and after the initial problems of organization had been overcome, requests for more authority and autonomy were received.

With continued assistance from field officers, periodic training sessions will be carried out throughout the year to ensure that the bands and their staff assume the position of

responsibility and authority that it is their right to exercise.

Under the Subsidy Housing Program up to 20 new homes will be built for Indians, and major repairs done to a corresponding number of older homes. The Subsidy Housing Program is an assistance scheme, not an all-inclusive program, and actual details within each settlement are the responsibility of band councils in consultation with band members.

The Off-Reserve Housing Program to provide homes for employed Indians is available to all who qualify under CMHC regulations. The maximum grant that can be made is $10,000; with the grant being based on the income of the applicant.

The low Rental Housing Program approved by the Yukon Territorial Government is also available to Indians who wish to apply. The two main conditions of eligibility are income of the applicant and availability of homes. This is a five year plan and its success will be based on acceptance by individual Indians or bands.

An accelerated program of total community improvement is being undertaken with emphasis on water services, sanitation, public wash-houses, roads, etc. A number of community halls and band offices are proposed where bands have made the request and funds can be made available.

Education

The Yukon Government Department of Education is responsible for the education of all in-school children in the Yukon. The responsibility of Indian and Eskimo Affairs lies in the northern B.C. Section and in the Yukon Region, i.e., Lower Post Residence and the federal school at Iskut Lake. The latter school is being transferred to the Terrace Agency 1 April 1972.

Responsibilities

- Assist the Department of Education in student enrolment in both elementary and secondary schools.
- Screen and fill out student applications for the two student residences, Yukon Hall in the Yukon and Lower Post Residence in Lower Post, B.C.
- Arrange for boarding home care, either partial or total, for students removed from access to regular school services, for students so recommended by school authorities and for students whose parents or guardians are migratory for at least four months of the year.
- Provide funds to enable students to attend educational institutions in or out of the Territory, to purchase books and supplies; and cover tuition fees, approved school activities, monthly allowances, transportation and clothing, etc.
- Assist students in finding part-time and summer employment through various agencies and the Opportunity for Youth Programs.
- Let bus contracts for isolated areas requiring the service for regular students and kindergarten children.
- Co-operate with the Department of Education re information and other data required on Indian students.

Plans for 1972

- Encourage and support parental participation in PTA and kindergarten programs.
- Provide orientation and counselling services to students and their parents who must leave the reserve to continue their education.
- Provide employment to students during the summer to develop self-reliance, promote healthy mental, physical, emotional and social development.
- Encourage students to discuss their problems freely and help out solutions with them.
- Encourage students on health care and assist in obtaining appointments for dental work, eye and ear examinations.

Employment, Relocation and Adult Education

Responsibilities

- Assess the skills of the Indian labour force and help them to obtain employment.
- Assess the skills needed for each type of employment and recommend training programs.
- Contact Manpower, Vocational School, Yukon Native Brotherhood and other interested agencies to develop and improve training facilities for Indian employees.
- Promote on-the-job training and follow-up interviews.
- Provide a counselling service to both employees and employers to ensure understanding on both sides.
- Provide guidance and counselling in the Off-Reserve Housing Program and integrate this program with the Relocation Program where feasible and desirable.
- Provide advice on adult education programs available through the regional office.
- Provide students with financial assistance to attend university, vocational schools or other institutions if it is relevant to the student's needs and outside the responsibility of the Yukon Territorial Government.

Plans for 1972

The Prospectors' Course under the auspices of Manpower and Vocational Training, being held at the Upper Liard Village will be completed by 24 February, with 43 of 45 adult students completing the course.

The Resource Management Officer Trainee Program is going as well as can be expected, with seven out of eight still attending. It has been recommended by forestry officials that in future, students wishing to attend this course take a forestry technology course to properly benefit from the Resource Management Officer Trainee Program.

The Indian and Eskimo Affairs Winter Works and Manpower's Local Initiative Programs are well under way, employing a major portion of our Indian labour force.

The Local Work Opportunities Program — a pilot project to replace social assistance — is being capably administered by the Whitehorse Band Council, and it is hoped that as a result of this pilot project other communities will benefit from the program in the future.

Economic Development Branch

Responsibilities

To plan, organize and initiate in co-operation with the Indian people, other government agencies, private firms, organizations and individuals, a comprehensive economic development program to include logging, saw-milling, big-game buiding, fish guiding, handicrafts, prospecting, trapping, fishing, commercial and industrial development and to stimulate a steady growth of self-reliance and economic independence.

Long-term Plans

To systematically develop small businesses and co-operative enterprises for the Indians; to provide the supervision, managerial and training support required to establish a firm foundation for eventual economic

independence in their own affairs; to narrow the credibility gap that exists between financial institutions and the prospective Indian businessman by establishing equity through the provision of grant assistance wherever possible.

Review of 1971 Operations

Fishing

The salmon harvest yielded 48,450 lbs. of which 45,000 lbs. were used for home consumption. Total value $31,490, down $38,500 from 1970.

Big Game Outfitting

The Frank Sidney Big Game Guiding business at Teslin successfully completed this year's operation while undergoing total reorganization. An Indian corporation controlled by Teslin Indian shareholders was successful in obtaining an IEDF loan for the purpose of purchasing Sidney's assets and developing the area potential for greater economic benefits in 1972. Frank Sidney will now retire after many years of providing employment for Indian guides. The new organization, Teslin Outfitters Ltd., will attempt to double first-year profits for the Teslin Indians.

Fishing Guides

The Dawson City Indian Band set up a fishing guide service for tourists. Further organizational assistance is necessary.

Handicraft

Gross sales from the Whitehorse retail outlet in 1971 reached $110,000, up $14,000 from 1970. Indian manufacturers were paid $87,000 for goods purchased for resale.

Logging and Sawmilling

The market for lumber was still depressed throughout 1971, thereby offering no incentive for the Ross River Sawmill Co-operative to resume operations. It is bankrupt and dissolution is being considered.

Mining

Courses in mineral prospecting were conducted at Ross River. They were highly successful and several Prospectors' Assistance Grants were awarded.

Trapping

Income to trappers was $45,000 compared with $74,000 in 1970.

Band-Owned Vehicles

Eight bands were provided with an IEDF grant/loan for the purchase of one-ton trucks in order to provide a means of generating band income from wood supply contracts to villages and tourist campgrounds, garbage removal from campgrounds and other local trucking operations.

Co-operatives

The Old Crow Co-operative Ltd. has progressively developed into a major source of economic benefit for the Old Crow Indians. First year gross sales in late 1970 were $90,000, returning $6,000 in patronage dividends to members. Employment was provided for two full-time and three part-time employees. 1971 sales were $172,000 with a dividend equity of $16,000 to members. Employment was provided to three full-time and four part-time employees.

Plans for 1972

Fishing

Co-operation and assistance from the Department of Fisheries has been obtained in conducting a feasibility study directed at commercial fishing in lakes with a view to utilizing small portable canneries. Salmon fishing and fish egg harvesting in Dawson City will continue to receive support. Assistance in the provision of nets and other equipment to fishermen will also continue, particularly to families fishing for domestic consumption.

Big Game Outfitting

A fully booked 1972 season for Teslin Outfitters Ltd. is anticipated for a first year gross income of approximately $60,000. Game conservation methods will be studied to ensure a lifetime renewable natural resource is maintained. It is estimated the area can support a $150,000 annual gross without ecological disruption. Further study of the area potential in developing a fly-in remote fishing lodge will also be conducted with probable opening in 1973.

Trail Riding

Assistance will be available to encourage facilities accommodating tourists on short day trips into an area populated by Dall sheep.

Agriculture

Minimum assistance will be provided to assist in developing grazing and feeding facilities for Indian-owned livestock.

Handicraft

Studies directed at increasing participation in Indian craft production will continue to receive priority for 1972. Handicraft production will be directed at using furs, thereby creating economic benefits for the trapper.

Trapping

Fur prices in 1972 are expected to be somewhat higher than in previous years, offering more incentive to the trapper. Assistance in the provision of traps will be made available.

Co-operatives

The Indians of Old Crow will manage their own Co-operative for 1972. Assistance and monitoring of management will be provided once monthly with regular inspection by a qualified bookkeeper. Training continues even though competent managers are now in evidence. The four-bedroom suite above the store will be converted into a five-room hotel with full facilities. Income to the Indian community from this source is estimated at $25,000 annually, derived chiefly from government personnel, oil companies and some tourists. Renovations necessary to accommodate the rapid growth and development of this business will be completed early in 1972. It is highly probable that this co-operative could successfully be the legal entity in control of several economic developments for the Old Crow Indians.

NATIONAL AND HISTORIC PARKS BRANCH

National Parks Service

Responsibilities

The National Parks Service is responsible for the operation of National Parks. This entails providing visitor services and protecting natural resources. The service also examines and evaluates sites for National Park potential, makes recommendations for the establishment of new parks and undertakes planning for the development of National Parks. There are four National Parks north of the 60th parallel — Wood Buffalo in the Northwest Territories and Alberta, Kluane in the Yukon, and Nahanni and Baffin Island in the Northwest Territories. The last three were announced 22 February 1972 by Jean Chrétien, Minister of Indian Affairs and Northern Development.

Long-term Plans (General)

- To undertake field studies aimed at identifying natural landscapes and environments in the north which are not yet represented in the National Parks System. These field studies are part of a long-range planning exercise which will facilitate the realization of 40 to 60 new

National Parks in Canada in the next three decades.

- To plan for the development of existing National Parks through resource inventory and environmental studies.

Plans for 1972 (General)

To undertake field studies of the Firth River in the northwestern corner of the Yukon, the Thelon Plateau and Ellesmere Island in the Northwest Territories and evaluate their suitability as National Parks.

Future National Park, Great Slave Lake, N.W.T.

An area of 2,680 square miles around Fort Reliance on the east arm of Great Slave Lake has been set aside since March 1970 as the nucleus of a future National Park. A report by the Canadian Wildlife Service on ecological surveys conducted at the request of the branch is being finalized. Discussions with the Snowdrift Band continued throughout 1971 to ensure that, before any final decision on the proposed park is made, the views of the band are fully considered. No additional field studies are planned for the area; however, discussions with the Indian band will continue as necessary.

Proposed Pingo National Park, Tuktoyaktuk Peninsula, N.W.T.

Pingos, large dome-like structures of ice covered by a thin mantle of soil and vegetation, are one of several frost phenomena which characterize northern environments. They are found occasionally in the Russian North and in Alaska but are more numerous in and around the Tuktoyaktuk Peninsula where more than 1,400 have been recorded. A recommendation based on preliminary studies suggested a 100 to 130 square mile area of Toker Point, immediately northeast of Tuktoyaktuk, be considered for a future National Park.

Field examinations of the Tuktoyaktuk Peninsula, Mackenzie Delta and environs were undertaken by the Canadian Wildlife Service, the International Biological Program (IBP) and National Park planners. A report on CWS studies is currently being prepared. IBP have prepared a checklist to provide a detailed biological inventory of Toker Point, soon to be released.

A representative of the National Parks Service in co-operation with Imperial Oil Limited, (which holds the lease to the lands involved in the park proposal) joined seismic crews on site in the spring and summer of 1971 to observe the type and extent of activities being undertaken. Pending further studies by the National Parks Service, Imperial Oil has agreed to restrict seismic work to the winter when there is least likely to be damage to the environment.

Proposals for Pingo National Park are still in the planning stage. Liaison with Imperial Oil will continue with a view to minimizing or removing obstacles to a mutually satisfactory arrangement.

Yukon Wild Rivers Study

In 1971 a preliminary study was made of wild rivers in the Yukon to establish how they can best be used by the National Parks Branch. Among the 15 rivers examined by 16 university students were the Yukon (the major river in the Territory) and the Pelly, Macmillan and Teslin rivers. A report of the survey has been released.

The scope of the study will be enlarged in 1972 to include the major Yukon rivers and to cover a sample of rivers in the Northwest Territories and several provinces. When completed the survey will enable the systematic selection of future wild river National Parks.

Wood Buffalo National Park

Review of 1971 Operations

The capital budget for 1971-72 was $249,000. The operations and maintenance expenditure for the year was $580,000. Expenditures were allocated as follows (amounts include application salary and wage costs):

General works	$138,000
Resource conservation	$325,000
Administration and general	$110,000
Visitor service	$ 7,000

In addition an unbudgeted amount of $2.2 million was spent in forest fire supression. The Park had 73 lightning-caused fires which burned about 588 square miles.

The bison management program comprised regular aerial surveys throughout the summer and a roundup for anthrax vaccination. No evidence of the disease was found among the 729 animals corralled and treated. Old corrals at Sweetgrass Landing and Hay Camp were replaced.

Two timber berths along the Peace River, comprising approximately 50 square miles with a number of substantial virgin timber stands in the development core of the park, were saved from logging by exchange for equivalent rights in an area along the Athabasca River.

Initial resource studies were conducted for the preparation of a provisional master plan for the park.

Plans for 1972

Tests for anthrax, brucellosis and tuberculosis among the bison will be carried out. Two timber berths along the Peace River will be closed during the summer due to expiry of the agreements. The provisional master plan for the park will be released this year.

The dwindling water level in the Peace-Athabasca delta continues to have grave ecological and socio-economic implications for the park and the native population, mainly in the Fort Chipewyan area. The branch is participating in an interdepartmental study to determine the effects of the Bennett Dam upon the water level of the delta and to recommend remedial measures.

Operation of the park will continue to stress improving the physical establishment, providing staff development, increasing knowledge of the park and supervising resource extraction such as hunting and trapping by native people and logging in timber berths.

Baffin Island National Park, NWT

Review of 1971 Operations

Following an aerial reconnaissance of the eastern coast of Baffin Island to find areas with National Park potential, representatives of the planning division and Canadian Wildlife Service conducted field studies in several areas. On the basis of this work and as a result of discussions with authorities on the natural resources of the eastern Arctic, the boundaries of the present park were determined. The 8,290 square-mile area was withdrawn and set aside as a National Park by Order in Council P.C. 1972-299, effective 22 February 1972. Included in the park is the Penny Ice Cap, one of the largest in the northern hemisphere, and a coastline incised by fjords up to 30 miles long. The mountains of the Penny Highlands rise to 7,000 feet and are crossed by long narrow valleys, many filled with glaciers. Offshore marine environments are also principal natural history theme in the Park.

Plans for 1972

Resource inventory and environmental studies to examine the flora, fauna and physical landscape of the park will begin this summer. Park master-planning staff will begin general planning on provisional development plans.

Nahanni National Park, NWT

Long-term Plans

A wild river theme will prevail in the development of Nahanni National Park. Although master planning studies have not been completed, it is anticipated that visitor services will be limited to primitive campgrounds, interpretive displays, marked hiking trails, and outfitter services.

Review of 1971 Operations

Authority to set aside an 870 square mile area along the South Nahanni River for a future National Park was received in April 1971. During the summer, boundary studies on a more extensive area were undertaken by park planners. Speleological studies were conducted under contract by Dr. D. Ford of McMaster University and a report on the cave system in First Canyon and Lafferty Canyon was submitted to the branch. Results of an ecological study conducted in 1970 by the Canadian Wildlife Service were received.

On 22 February 1972, Order in Council P.C. 1972–300 became effective, ordering the withdrawal of 1,840 square miles along the South Nahanni River for a National Park. The park contains the major portion of the South Nahanni, one of North America's finest wild rivers; many hotsprings including Rabbitkettle Hot-springs, a dome-like structure of limestone precipitate (calcareous tufa) which rises 90 feet above the valley floor; a weather-eroded sandstone formation; several unusual floral communities; wildlife habitat; and a well-developed system of natural caves and karst topography.

Plans for 1972

Resource inventory will continue and park master-planners will begin preliminary studies to identify sites for potential development. An agreement with the Territorial government for fire prevention and protection is expected.

Kluane National Park

Review of 1971 Operations

Before the establishment of Kluane National Park in February 1972 by Order in Council P.C. 1972–238, the land was part of the Kluane Game Sanctuary and the Kluane Park Reserve. During 1971, resource and boundary studies were carried out by staff of the National Parks Service. A report on wildlife in the area by Dr. A. Pearson of the Canadian Wildlife Service was submitted to the branch.

Covering 8,500 square miles, Kluane is the second largest National Park in Canada. It contains Mount Logan, Canada's highest mountain; an extensive system of icefields and glaciers; and the world's largest unhunted bands of Dall sheep.

Plans for 1972

Resource inventory will be continued by the branch. Rehabilitation of the experimental station at Haines Junction for use as a parks administration site will begin. Planning studies for the development of the park will commence.

National Historic Sites Service

Responsibilities

During the past several years, the National and Historic Sites Service has carried out a study of persons, places and events in the history of the Yukon and Northwest Territories. A number of items have been identified as being of national historic importance. They will be commemorated by the federal government with assistance, where advisable, from the governments of the Yukon and Northwest Territories.

Long-term Plans

To assist Territorial governments in their historic-marking programs. To implement, after acceptance by the Minister of the Department of Indian Affairs and Northern Development (and according to priorities), recommendations by the Historic Sites and Monuments Board of Canada.

A number of sites have been examined in the Northwest Territories and plans are proceeding for plaques and ceremonies for three sites: Frobisher Bay commemorating Sir Martin Frobisher; Coppermine, commemorating the discovery of the Coppermine River by Samuel Hearne: and at Enukso Point on Baffin Island, site of a collection of Inukshuk. (Inukshuk are arrangements of stones, generally in the shape of the human body, which may have been built some 2,000 years ago.)

A major project is the development of the Klondike Gold Rush International Historic Park, a significant feature of which will be the joint development and interpretation by the United States and Canada of the historic Chilkoot and White Pass Trails from Dyea and Skagway to Bennett, B.C. The establishment of a Yukon historic waterway between Dawson and Bennett is planned, with the objective of preserving the natural and significant historical features.

The most significant portion of the National Historic Sites Service program in the north relates to Dawson City, where a number of old buildings will be renovated. Of particular interest are plans for period restoration of the post office building; restoration of the commissioner's residence, with interpretation centred on the post-fire period; and period restoration of Ruby's Place and the Bonanza Hotel.

Some development is also planned at Bennett, where it is intended to refurbish the old Presbyterian church at the site and establish exhibits relating to the trails and trek to the gold creeks.

The "Gold Room" at Bear Creek will be moved to Discovery Claim to represent the more advanced gold-mining operation. The Robert Service cabin will also see full period restoration and interpretation.

Review of 1971 Operations

A firm of Canadian consultants who visited the Canadian portion of the Chilkoot Trail have made recommendations for appropriate development of that trail. These are under evaluation by the department. The sternwheeler S.S. *Klondike*, being restored at Whitehorse, was opened to the public in 1971. The Klondike will, with the S.S. *Keno* which was restored before the beginning of the current program, commemorate the history of transportation in the Yukon. In addition to the sternwheelers and the Palace Grand Theatre, also reconstructed earlier, the department has acquired the Bonanza Hotel, Ruby's Place, the post office building and annex, St. Mary's Hospital (Court House), commissioner's residence, administration building, the Klondike Thawing Machine Building, two blacksmith shops, and the North-West Mounted Police Barracks. An agreement has been signed with the Territorial government for the transfer of the RCMP married quarters, gaol and stable. The department is awaiting the transfer of papers for the Dawson Daily News, Red Feather Saloon and the Bank of North America building.

In the past some 40 old buildings in Dawson City were examined by the department's architectural and historical research staff and considered by the Historic Sites and Monuments Board of Canada, the Minister's advisers on historical matters. The most historic and typical of those buildings

examined were chosen for commemoration and restoration. As-found drawings have been made and partial stabilization of some of the buildings has been carried out.

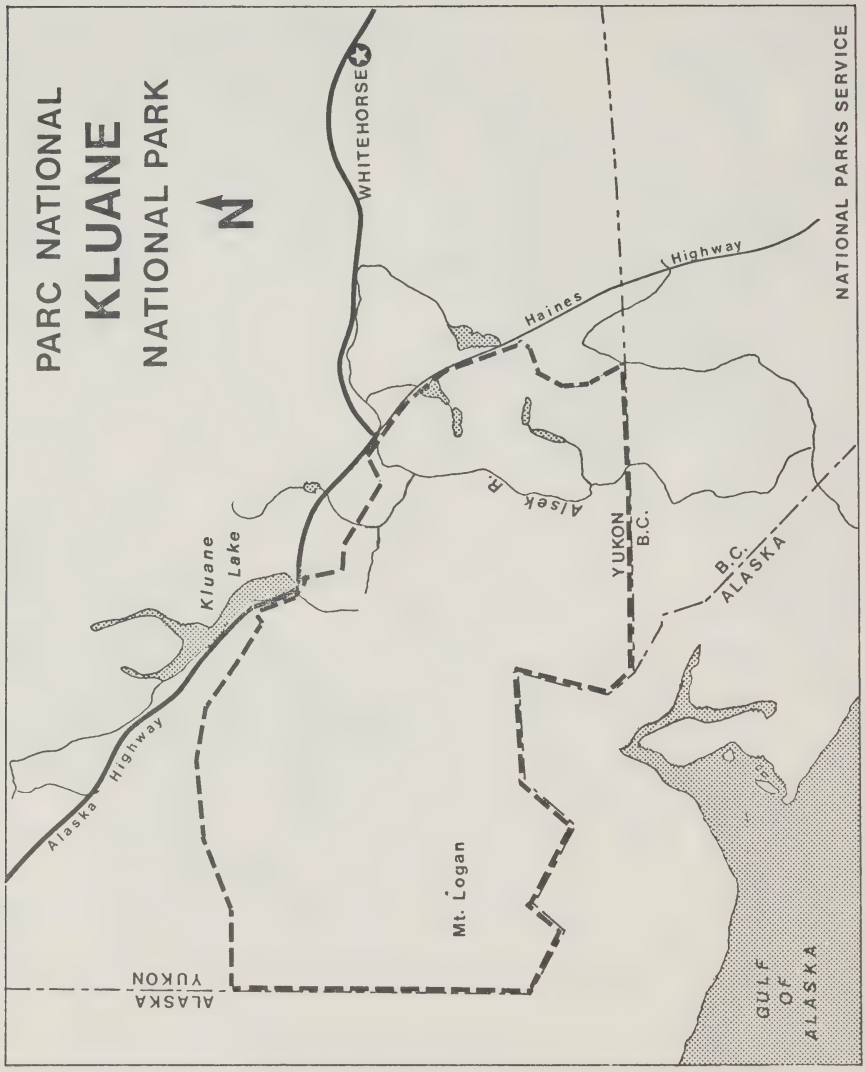
During 1971 the department acquired George Shaw's outdoor museum collection, which includes mining equipment, a fire engine and other machinery, and Anita John's collection of negatives and photographs of the Gold Rush.

Plans for 1972

Negotiations will continue for the acquisition of other buildings in Dawson and for lots around some of the buildings. Restoration of the S.S. *Klondike* and S.S. *Keno* will continue. Stabilizing of the foundation of the post office building will begin and some restoration work will be done on the Palace Grand Theatre.

General stabilization of buildings will continue.

PARC NATIONAL
NATIONAL PARK
BAFFIN ISLAND
BAFFIN ISLAND
ARCTIC CIRCLE
QUEBEC
DAVIS STRAIT
PENNY ICE CAP
Pangnirtung
CUMBERLAND
SOUND
N
NATIONAL PARKS SERVICE


PARC NATIONAL
KLUANE
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WHITEHORSE
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NATIONAL PARKS SERVICE
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YUKON
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ALASKA
Alaska Highway
Mt. Logan
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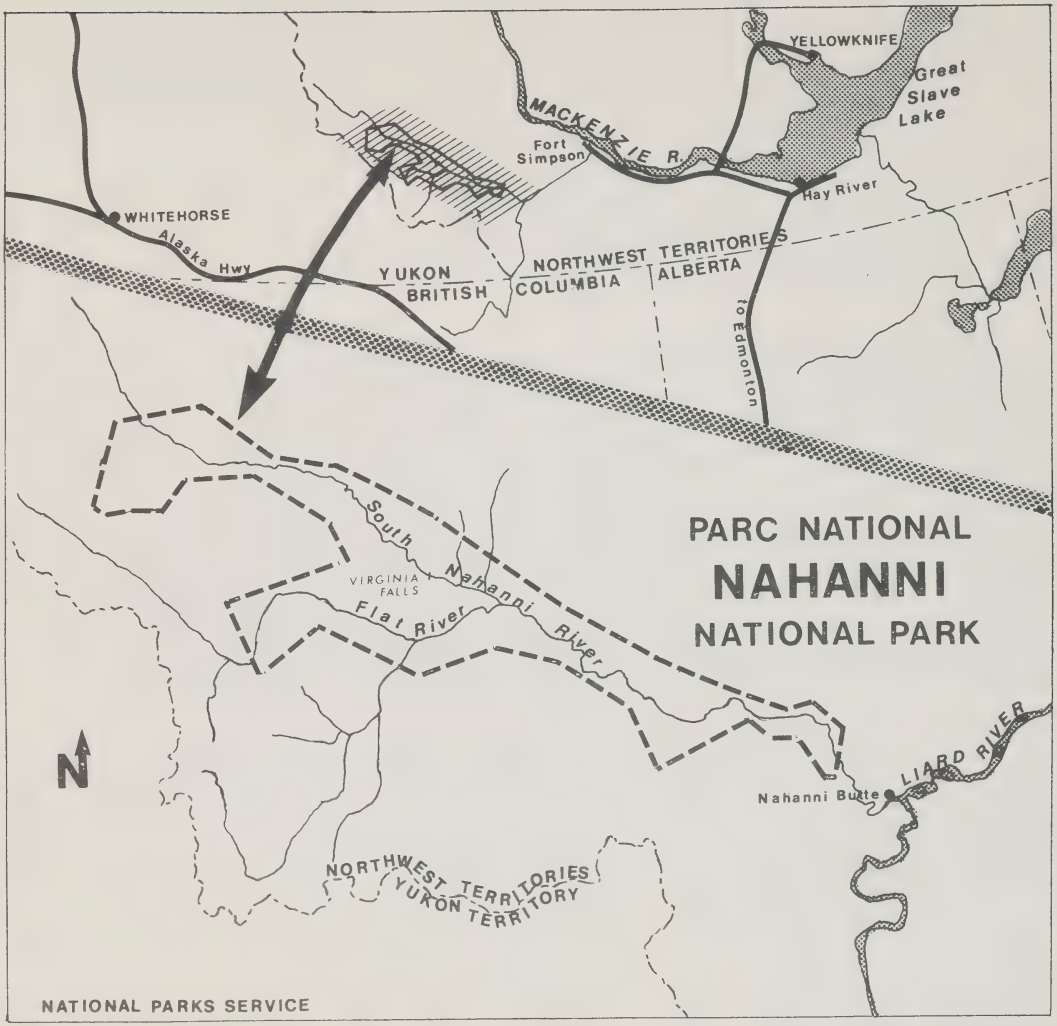
YELLOWKNIFE
Great Slave Lake
MACKENZIE R.
Fort Simpson
Hay River
WHITEHORSE
Alaska Hwy
YUKON
BRITISH COLUMBIA
NORTHWEST TERRITORIES
ALBERTA
to Edmonton
PARC NATIONAL
NAHANNI
NATIONAL PARK
South Nahanni River
VIRGINIA FALLS
Flat River
N
Nahanni Butte
LIARD RIVER
NORTHWEST TERRITORIES
YUKON TERRITORY
NATIONAL PARKS SERVICE

NORTHERN ECONOMIC DEVELOPMENT BRANCH

Responsibilities

The Northern Economic Development Branch is responsible, on behalf of the Minister and the federal government, for the effective management of oil and gas, minerals, water, forests and lands and for developing the economy of the Yukon Territory and the Northwest Territories. Its tasks are to seek out and identify all means whereby the economy of the north can be expanded more rapidly, to develop a broad plan of economic progress, and to recommend, and in some instances manage, specific projects and policies for achieving this objective.

Oil and Mineral Division

Oil and Gas

Review of 1971 Operations

Oil and gas expenditures in the Yukon Territory and the Northwest Territories exceeded $153 in 1971, an increase of $25 million over the previous year. Most of the drilling and seismic explorations were concentrated in three geographic and geologic areas; the Eagle Plain of the Yukon Territory, the Mackenzie Delta-Tuk areas and Arctic Islands, specifically in the Sverdrup Basin.

Table 1 — Revenues Received, 1971

Yukon Territory	Revenues (dollars)
Permit fees	4,750.00
Transfer fees	360.00
Lease fees	85.00
Rentals	126,111.00
Forfeiture	12,156.96
Bonus	NIL
Royalties	4,660.40
Total	148,123.36

Northwest Territories	Revenues (dollars)
Licence fees	4,900.00
Permit fees	443,500.00
Transfer fees	59,236.52
Lease fees	1,130.00
Rentals	3,680,099.85
Royalties*	150,000.00
Forfeiture	462,035.64
Bonus	NIL
Miscellaneous	1,646.45
Total	4,802,548.46

*Estimated

Surface geological and photogeological surveys by the oil industry (measured in geological crew months) were as intensive as in 1970. Surveys were conducted by V. Zay Smith and Associates, and Geophoto Services Limited on the mainland of the Yukon and Northwest Territories; by J.C. Sproule and Associates, on the Arctic Islands; and Pallister and Associates in carrying out their "Polarquest" programs in the Arctic and Baffin Island areas.

Staff of operations "Polarquest" and "Baffinquest", managed by Pallister and Associates, carried out seismic reflection surveys over 350,000 square miles surrounding the Arctic Islands. More than 65 companies subscribed to 20 undertakings representing expenditures of about $7.6 million for the second year of a four-year program. Activities in 1971 included field geological work, bathymetric studies, aeromagnetometer surveys, gravity surveys and marine seismic reflection surveys covering 12,315 statute miles. About 15 contractors and sub-contractors were involved in the field operations.

Seismic exploration in 1971 was at the same level as in the previous year. A total of 225 seismic crew-months was recorded, including marine seismic studies in the Mackenzie delta, Beaufort Sea, and Baffin Bay areas. The extent of seismic exploration indicates considerable drilling in the future since it takes one to two seasons of seismic work to find suitable drilling sites.

The number of man hours expended on geologic and seismic exploration for 1972 is expected to remain the same. Costs will increase 30 to 40 percent because much of the work is now being carried out in remote areas.

On the Mackenzie delta frontier of Canada's Arctic coast, there were gas and crude oil discoveries at Imperial-Taglu G–33 and Imperial-Mayogiak P–17 wildcats, with preliminary surveys at the two finds indicating a potential for major oil and gas deposits. With a late freeze-up in 1971, the oil industry was delayed in moving in rigs and equipment for winter drilling, designed to evaluate the 1971 discoveries more fully and to test a number of additional prospects.

On the Arctic Islands (Sverdrup Basin), 1971 brought the third important natural gas discovery, at Panarctic et al Kristoffer Bay G–06, on the southwest side of Ellef Ringnes Island. It follows up the 1969 Panarctic gas discovery at Drake Point on Melville Island, and the 1970 Panarctic gas discovery on King Christian Island. The current winter season involves the biggest exploration in Arctic Island history, with nine rigs on sites scattered over half a million square miles. A tenth rig is being moved in.

Several major oil companies (Imperial Oil, Gulf Oil of Canada, Chevron Standard) have joined the Arctic Island oil and gas search, mainly on farmouts from Panarctic. So too have four U.S. natural gas companies, seeking gas supplies for after the mid 1970s, in the expectation that the Islands will yield gas reserves in excess of Canadian needs.

Gas Arctic Systems is already studying ways to build pipelines from the Islands into mainland North America; Panarctic Oils Ltd. across Barrow Strait, and others by way of Ellesmere Island to Atlantic markets.

The number of wells drilled and seismic crew months worked will increase in 1972. Extensive marine seismic study is proposed for the Beaufort Sea and with ice breaker assistance in Melville Sound, Kane Basin and Norwegian Bay areas. The continuation of wildcat drilling in the Arctic by Panarctic Oils, Imperial Oil, Gulf Oil of Canada and others, wildcat drilling in the Delta areas by the major companies, and the proposed participation drilling scheme by Horn River

Table 2 — Number of Permits and Leases, and Relevant Acreage — December 31, 1971

Area	No. of Permits	Acreage
N.W.T. mainland	1186	99,320,100
Y.T. mainland	591	29,736,657
Arctic island (1)	5392	267,728,745
Arctic coast marine (2)	1513	72,745,539
	9382	469,531,041
	No. of Leases	
N.W.T. mainland	719	4,436,793
Y.T. mainland	63	252,222
Arctic island (1)		
Arctic coast marine (2)	782	4,689,015

Resources will increase the number of wells drilled to at least 100 in 1972. Drilling and seismic survey work will increase substantially in the other frontier areas and total expenditures may exceed $175 million in 1972.

Panarctic Oils Limited

In 1971 Panarctic Oils continued its large and comprehensive exploration program in the Arctic Islands. Additional farm-out agreements were concluded on low-priority drilling prospects, thus concentrating efforts in meeting high-priority commitments and in drilling on more favourable structures in the Sverdrup Basin.

Geological surveys were continued on most of the Arctic islands. A five-month geophysical study using three geophysical crews was successfully completed by tracked vehicles in which approximately 900 miles of reflection seismic surveys were carried out on Ellesmere Island, Melville Island and Amund and Ellef Ringnes islands.

Drilling is being carried out with four rigs; an additional large rig will be moved to the islands in early 1972, bringing the total number of rigs in the Arctic islands to 10.

By the end of December 1971, Panarctic Oils had received payments of $26,256,250 from the federal government.

Mining

The year saw considerable expansion in the mining industry for the Yukon Territory, with value of production going from $77,500,933 in 1970 to $84,031,000 in 1971, an increase of 8.4 percent. This rise was due mainly to an increase in the production rate at Anvil Mining Corporation's Faro mine. Output was from six mines — one lead-zinc, one silver-lead-zinc, one asbestos, one copper, one gold-zinc, and a coal mine.

By contrast, in the Northwest Territories the value of production dropped from $132,627,613 in 1970 to $98,132,000 in 1971, a decrease of 33 percent. The drop in production was mainly due to lower output at the Pine Point lead-zinc property, which is the largest single producer in the NWT. The overall decrease in value of production for the two Territories was 8 per cent. Production in the NWT was from five mines — two gold, one lead-zinc, and two silver-copper mines. Total mineral claims recorded in the two Territories amounted to 13,421, a drop of 12,672 claims over 1970. However, 42 prospecting permits were granted in the NWT which brought the total permits issued to 114, covering approximately 14,000,000 acres.

Yukon Territory

There were 6,716 mineral claims recorded in the Yukon Territory in 1971, a drop of 4,803 from that of 1970.

Exploration in the Yukon during 1971 consisted of continued detailed exploration in known mineralized areas. Detailed geological mapping and diamond drilling were carried out in the Anvil-Vangorda area of several companies. The Dawson Range syndicate, United Keno Hill Mines, Silver Standard Mines and others explored what appears to be developing into a major copper mineral district north of Carmacks on the west side of the Yukon River.

Two of Yukon's producing mines ceased production in 1971. Venus Mines Ltd., with a gold-silver-lead mine on Windy Arm, south-east of Carcross, stopped production in June 1971 after less than one year's operation. Whitehorse Coppermine Ltd. (formerly New Imperial Mines Ltd.) discontinued open pit mining and milling operations because of a decline in world copper prices that made the operation uneconomic. Development of the rich underground ore is continuing, however, and it is anticipated that production will start early in 1973.

United Keno Hill Mines continued milling at a rate of 270 tons a day with ore coming from the Elsa, Calumet and Husky Mines. In addition, exploratory and development work was resumed at the No Cash Mine on Galena Hill and several other properties on Keno Hill. Anvil Mining Corporation Ltd., 130 air miles northwest of Whitehorse, which came into production at 5,500 tons a day in 1969, has increased its rate to 7,248 tons a day in 1971. Gondola-type containers are used to truck concentrates to railhead at Whitehorse, a distance of 240 miles. The containers are then transferred to railway cars for shipment to tidewater at Skagway, Alaska and then by deep sea vessels to world markets.

Cassiar Asbestos Corporation, on Clinton Creek 50 miles northwest of Dawson, has exceeded its designed production rate of 80,000 tons of fibre. Production for 1971 has topped 100,000 tons.

Hudson-Yukon Mines Ltd. has completed construction of surface plant, mill and mining plant at its Wellgreen property on Quill Creek. Underground development and stope preparation are continuing at the mine. It is anticipated that the property will come into production during 1972. Concentrates will be shipped to Japan. Earlier work established 3,250,000 tons of ore, grading 2.04 percent nickel and 1.4 percent copper.

Hudson Bay Mining and Exploration Ltd. continued with exploratory work on the Tom claims at McMillan Pass on the Yukon-Northwest Territories border.

Northwest Territories

There were 6,705 mineral claims recorded in the Northwest Territories in 1971, a drop of 8,869 from 1970. In addition, 42 prospecting permits were granted covering approximately 2,560,000 acres of mining lands.

Exploration continued in all parts of the Territory without a particularly important lead-zinc find in the Arctic islands. This work is expected to continue in 1972.

Cominco, in conjunction with Bankeno Mines Ltd., continued exploration, including diamond drilling on a lead-zinc property on Little Cornwallis Island. This is considered an extremely good prospect and the drilling is to be stepped up during 1972.

Considerable interest is still shown in the silver occurrences in the Great Bear Lake area.

Giant Yellowknife Mines Ltd. discovered highly mineralized copper-nickel float on its prospecting permit areas in the Perry River area. Work in 1971 traced mineralization over a length of 2,100 feet along the strike of a pyroxenite zone. Chip sample across two trenches assayed 1.5 per cent copper and 0.2 per cent nickel over a width of 17.5 feet.

Savannah Creek Gas and Oil Ltd. and Rio Alto Exploration Ltd. staked 733 claims in this vicinity.

Pine Point Mines Limited averaged 10,545 tons a day grading 2.89 per cent Pb and 6.6 per cent ZN. They are continuing systematic drilling for additional ore bodies west of their present pits with good success. Indications are that reserves will rise again this year from the 43,500,000 tons given at the end of 1970.

Con-Rycon-Vol is producing at a rate of 470 tons a day during the summer and 390 tons a day for the same period last year. The grade is slightly lower than during the previous period, but the increase in milling rate has increased their production by 10 per cent.

Giant Yellowknife Mines Ltd. — Production dropped from a rate of 1,164 tons a day in 1970 to 1,108 tons a day in 1971. The mill head grade is up slightly from last year but gold production is down compared to 1970. Drilling in the vicinity of the "A" shaft has indicated that between 60,000 and 70,000 tons of ore grade material remain in the old stopes in this area of the mine. As a result, Giant is now rehabilitating "A" shaft in preparation for further mining.

Terra Mining and Exploration Company on Rainey Lake, 40 miles south of Great

Bear Lake, is currently operating at 155 tons a day on its lead-zinc-silver property.

Echo Bay Mines – Production at Echo Bay is up from a year ago, but their grade is down slightly to 55 oz. Ag/ton which has reduced the quantity of silver produced. The company has close to a year's reserves broken in its stopes and is continuing the search for additional deposits at their No. 4 adit level and No. 7 adit level, above and below the diabase intrusion.

Federated Mining – Federated installed a 100 tons per day mill brought to the property by barge in September 1971. Over 2,000 tons of ore are available for milling.

Cadillac Mining & Exploration completed exploration of a silver-lead-zinc deposit in the Nahanni area and is now studying the feasibility of bringing this property into production. Results indicate a deposit of 2 million tons grading 13 per cent zinc, 11 per cent lead and 5 ounces of silver per ton.

The following table shows preliminary production figures for 1971 and comparative figures for 1970 for the Yukon and the Northwest Territories.

Northwest Territories		1970	1971
Gold	$	12,168,776	10,814,000
	Ounces	332,844	306,000
Silver	$	5,114,587	2,669,000
	Ounces	2,764,642	1,711,000
Copper	$	766,578	158,000
	Ounces	1,320,502	300,000
Lead	$	37,842,405	22,514,000
	Pounds	239,206,099	166,774,000
Zinc	$	76,004,563	61,950,000
	Pounds	477,115,900	370,292,000
Cadmium	$	737,632	27,000
	Pounds	207,200	14,000
Bismuth	$	3,072	– –
	Pounds	490	– –
	TOTAL	$132,637,613	$ 98,132,000
Yukon Territory		1970	1971
Gold	$	653,034	601,000
	Ounces	17,862	17,000
Silver	$	7,845,312	9,129,000
	Ounces	4,240,709	5,852,000
Lead	$	20,830,196	29,185,000
	Pounds	131,670,010	216,184,000
Copper	$	9,148,995	2,693,000
	Pounds	15,760,000	5,100,000
Zinc	$	24,845,216	28,362,000
	Pounds	155,964,948	229,302,000
Cadmium	$	261,528	161,000
	Pounds	73,463	83,000
Asbestos	$	13,927,652	13,900,000
	Tons	105,638	99,000
	TOTAL	$ 77,511,933	$ 94,031,000

MINING REVENUE – 1970

N.W.T. & Yukon

Fees	$ 513,856.75
Royalties	707,423.73
Sale of claim sheets	3,414.75
Forfeitures	8,683.00
Lease rentals	31,847.85
Miscellaneous	3,918.27
TOTAL	$1,269,144.35

Development and Incentive Program

The major task of this section during the year was the administration of the northern roads and airports program. Its secondary function was to administer the Northern Mineral Exploration Assistance Program and the incentive programs related to access road and airstrip construction assistance.

The Northern Roads Program, approved in 1965, provides for a 10 year $100 million project to construct roads that connect centres of population and provide access to areas of resource potential. However, experience in administering the program indicated that further policy amendments were necessary. Accordingly, a memorandum to Cabinet, "Northern Roads Policy 1971", went out early in December 1971, and was subsequently approved.

One of the main features of the revised policy is the provision for the construction of pioneer roads. This new category is designed to provide limited access roads into undeveloped areas with natural resource potential.

The new policy also provides for conservation measures which will further protect the northern lands and minimize surface disturbance from transportation operations.

Expenditure on new highway construction for the past five years was $43 million. For 1972, $10 million is budgeted, and by 1977 the aggregate total is now estimated at $131 million.

New highway construction costs are supplemented by a reconstruction budget which averages $3 million a year.

The Northern Resources Airports Program provides financial assistance, on a cost-shared basis, for the construction of airports intended to provide access to resource exploration and development projects. Since its inception in 1965, 24 applications have been approved and a total of $473,780 has been paid in contributions. A further $200,000 will be spent this year and in each of the next four years.

To encourage the direction of capital to northern ventures, the Government has introduced the Northern Mineral Exploration Assistance Program under which 40 per cent of all exploration costs of mineral and oil and gas may be recovered, and are repayable only if, as a result of the discovery, production ensues.

Since the inception of the program in 1967, 133 applications have been approved and a total of $3,302,000 has been paid in grants, leaving an outstanding commitment of $813,000.

Plans for 1972

Development Analysis

During 1972 heavy emphasis will be placed on the development of ground access

to Inuvik, NWT. The increasing pace of activity in the Mackenzie Delta and the Arctic islands regions and the need to connect one of the major population centres of the north to the northern roads network makes it imperative that road access from the south be completed as soon as possible.

Under the Northern Mineral Exploration Assistance Program the same amount of money will be made available as in 1971.

The use of incentives will be stressed in 1972 to encourage the development of resources in the north to provide permanent employment for northern residents.

Water, Forests and Land Division

Environmental Management

The responsibilities of the Pipeline Section were revised in 1971 to provide for protection against damage to the environment due to pipeline development. Studies were done on the pipeline route to Pointed Mountain, NWT, and conditions for protection of the environment were included in the negotiated land tenure agreement for the pipeline right-of-way.

An evaluation was made of possible harm to the environment which might be caused by highways, airstrips, pipelines and oil and gas fields and restrictive covenants included in land tenure agreements as a protective measure.

Water Management

During 1971 specialists in water management were posted to the regional offices. They will constitute the nucleus of a water management staff in each region.

A great deal of effort was devoted to preparing regulations under the Northern Inland Waters Act in readiness for implementation soon after formation of the Territorial water boards early next year. Regulations for the Arctic Waters Pollution Prevention Act were also drafted by the Water Section but have not yet been promulgated.

The section continued its inventory of hydro-electric power potential. Approximately one third of the Territories has now been surveyed and it is planned to continue the project until the entire area has been covered. The section continues to administer the Dominion Water Power Act and to collect water and land rental fees for licenced hydro-electric developments in national parks and in the north.

Land Use Management

The passing of amendments to the Territorial Lands Act in 1970 paved the way for the development of regulations respecting the protection, control and use of the surface of lands in order that the ecological balance or physical characteristics of any area in the Yukon Territory or Northwest Territories could be protected.

Since these regulations would apply to a very large area of land with differing climate, topography and biota and would cover many different types of operation, and since it was necessary that they be workable and yet provide maximum protection, it was evident that problems would be numerous. In order to help the Government write the regulations, an advisory group comprising representatives of the petroleum industry, the mining industry, conservationists, universities and Government was formed. Several drafts were written, and during this period there were consultations with the Yukon Territory and Northwest Territories governments, industrial agencies, other Government departments and conservationists. In June 1971 draft regulations were published in Part I of the Canada Gazette and a waiting period provided all interested parties with the opportunity to present their views and comment on the proposed regulations. Several of the representations received resulted in further revisions being made to the regulations. This final revision provided the regulations which were approved by the Governor General-in-Council and became law on 15 November 1971.

The Regulations are divided into three parts:

- Part I sets out a series of general regulations concerning the use of land throughout the Yukon Territory and Northwest Territories. These regulations refer specifically to water crossings, clearing of lines, trails and rights-of-way, cleanup requirements and fuel storage.
- Part II deals with regulations that will apply to operations conducted within a land management zone and refers to application for permit, plans, inspection requirements, terms and conditions of a permit, fees and security deposits.
- Part III refers to the powers of officials administering the regulations, default, suspension and cancellation of permits, appeals and procedures.

The Territorial Land Use Regulations are designed to set the ground rules for exploration and development in order to achieve the greatest environmental protection without prohibiting or excluding such undertakings.

To administer the Territorial Land Use Regulations and manage the department's renewable resource program, regional offices were established at Whitehorse and Yellowknife. The regional manager at each of these offices was given the task of setting up the administrative machinery to accept applications for land use, issue permits to operators and hire the necessary personnel to carry out inspection of the operations.

Forest Management

The forest surveys program in the Yukon Territory and the Northwest Territories continued in 1971 with two final reports on the Lower Liard River (Area C) and Zone 4 – Upper Liard Forest Unit being prepared for publication in March. Certain phases of these projects covering the Lower Liard River in the Northwest Territories and the Upper Liard, Pelly and Tagish areas in the Yukon Territory will continue into 1972, and will provide the necessary data for the establishment of timber harvesting areas and allowable annual cuts for the next 10 years.

This information, along with evaluation of forest sites, fire damage and incidence of forest diseases and insect infestation will form the basis for allocating harvesting rights and the identification of alternative forest values and uses.

Territorial Timber Regulations are being reviewed and their applicability is being examined in the light of changing economic conditions and the enforcement of proper forest management practices.

Timber Production

Timber production in the Territories in 1971 decreased significantly from approximately 20 million board feet in 1970 to less than 12 million board feet, partly because local buyers were no longer satisfied with poorly produced and ungraded lumber, and partly because of the local preference for fir and hemlock.

Forest Protection

In 1971 the worst fire season on record was experienced by the Northwest Lands and Forest Service. As in 1970, there was severe drought south of Great Slave Lake which, coupled with numerous dry lightning storms, accounted for the disastrous tally of 330 fires burning 2,047,370 acres. The normally short fire season was considerably lengthened this year as fires started as early as April, and in September lightning started a number of fires which seriously threatened the towns of Hay River and Pine Point.

The Yukon Lands and Forest Service had a shorter but also difficult season with 139 fires burning 634,969 acres. Without the help of periodic rains a far more serious situation could have developed.

Arctic Land Use Research Program

This program is intended to generate baseline information and to research problems arising from land and water use in the north. Co-operation with the scientific community and industry is facilitated by an advisory committee chaired by the ALUR manager and with members drawn from the universities and industry. The research projects are performed under contract by university scientists and also by arrangement with other government departments.

The 1971—72 program included studies on the problems associated with oil and gas exploration in the Mackenzie delta and Arctic islands, water quality and the containment of mine wastes, terrain stability and erosion and their relationship to the removal of forest cover, terrain classification and sensitivity to disturbance. Also, the Department of the Environment is preparing on our behalf a series of land-use information maps summarizing information on renewable resources and activities involving man; the first series of 44 maps covering the Mackenzie valley and northern Yukon will be completed by the end of May 1972.

It is particularly interesting that observations made in connection with oil and gas exploration during the summer of 1971 showed that minimal surface damage had resulted from the 1970-71 winter seismic operations carried out by Elf Oil and Deminex on Banks Island; also, monitoring of Gulf Oils' 1971 summer seismic operations in the Eskimo Lakes area led to the conclusion that such work can, in appropriate circumstances, be carried out without undue damage to the tundra.

Some of the research projects were extended or modified during 1971 to encompass work pertinent to the Environmental Social Program, Northern Pipelines. Major studies on waste disposal and oil spills were initiated as part of that program.

Land Administration Section

Reorganization of the field structure in the Northwest Territories, involving the appointment of resource management officers at Inuvik, Norman Wells, Fort Simpson, Hay River, Fort Smith and Fort Liard to act as land agents for federal Crown lands was completed in 1971. Applications for lands in the Yellowknife area will continue to be filed directly with the Supervisor of Lands office at Yellowknife.

In keeping with the recommendations of the Carrothers Commission and as part of the department's continuing policy of granting greater autonomy and more responsibility for local matters to the Territorial government, a five-year plan was initiated in 1970 to transfer to them the administration of large tracts of land, designated as Development Control Zones, within and immediately surrounding the communities under their jurisdiction. This will enable the Territorial governments to plan and control development within municipal boundaries and surrounding areas in concert with the local councils. The only exceptions to the transfer of Development Control Zones lands are those needed by federal departments and agencies in connection with continuing federal government projects, including the lands occupied by or reserved for Indians and Eskimos.

During 1971 approximately 393 sq. miles were transferred to the administration of the Territorial governments as Development Control Zones, encompassing the Hamlet of Faro in the Yukon Territory and the Town of Fort Providence, settlements in the Northwest Territories. All applications for lands within the designated Development Control Zones are processed through the Territorial governments pending the completion of transfer for each community.

More than 200 surveys were co-ordinated on behalf of the federal and Territorial governments and the general public in 1971 to meet the growing demand for residential and commercial lands, and to accommodate installations necessary to the increased mining and oil and gas exploration. In excess of 800 new applications for lands in both Territories were filed and dealt with, and numerous requests by other departments and agencies for the establishment of new reservations were processed. As well, several leases were negotiated with exploration and development interests to meet their demands for land.

Plans for 1972

Environmental Management

During 1972 an evaluation of granular deposits will be started. A heavy demand for granular material is anticipated to meet the needs of major development projects. Such material is not common in the Mackenzie valley and surveys to determine location, quality and quantity of granular deposits will ensure the best use of such supplies as are found. Quarrying regulations are being revised to provide authority for more acceptable use of granular deposits.

Water Management

Water licensing will begin in 1972 with proclamation of the Northern Inland Waters Act and promulgation of regulations under the Act. In support of this operation, water quality monitoring will begin, and water uses investigated. The inventory of hydro-electric power potential will continue.

Land Use Management

By 1972 there should be 150 full-time employees in the two Territories administering the department's renewable resource legislation. During 1972 it will be necessary to thoroughly study the effectiveness of the Territorial Land Use Regulations in order to assess their effectiveness for the protection of the northern environment, and to determine the effect they have upon exploration and development.

So as to make the regulations as effective as possible information provided by the Arctic Land Use Research group and other consultants will be summarized and made available to field personnel.

Arctic Land Use Research Program

In 1972 research will continue on terrain disturbance due to the use of heavy equipment, particularly in oil and gas exploration. It will seek to devise a quantitative index of surface damage to determine the degree of disturbance that different terrains can tolerate and to further develop methods of terrain restoration by revegetation. Studies will be undertaken in the tundra (Mackenzie delta and Arctic islands) and in the boreal forest (Norman Wells, Fort Wrigley and the Liard River watershed). In the boreal forest studies, attention will focus on erosion hazards and river bank stability.

The series of maps on land use will be extended to cover the western and southern parts of the Yukon Territory. Also, preliminary work will be undertaken on a holistic approach to land use management in the southern Yukon.

Studies of water quality in relation to difficulties associated with mine waste containment in a northern environment will be carried out at two additional mine sites. The results of this work will be combined with earlier findings to assist in formulating acceptable operational criteria for containment and disposal of mine tailings.

Financial support will be provided to the Geological Survey of Canada for its terrain classification work under the Environmental Social Program, Northern Pipelines. Several of the studies referred to above have implications for the pipeline program. In addition, work is now underway on waste disposal from exploration and construction camps (in collaboration with Public Health Engineering Division, Department of the Environment), archaeological survey (in collaboration with

the National Museum of Man) and land base oil spills.

Forest Protection

During 1971 forest fires did extensive damage in the Northwest Territories. A complete reorganization of fire protection strategy is planned for early in 1972 under the direction of a task force composed of officials from the Yukon Lands and Forest Service and the Northwest Lands and Forest Service with direction from the Water, Forests and Land Division. This task force will be examining all aspects of operations and policy in an effort to meet changing needs and to give better protection to private property and natural resources. It is expected that a larger and more efficient fire protection organization will be recommended by the task force.

During 1971 three district superintendents were appointed to the Northwest Lands and Forest Service. As a result two new major fire protection bases are being planned for 1972 at Yellowknife and Inuvik. These bases will include offices, warehouses, garages, and staff houses to accommodate initial attack crews for fire protection.

The fire protection organization in the Yukon is being strengthened considerably by the addition of more water bombers, more support aircraft and a number of trained initial attack crews.

The former protected and non-protected zones in both Territories are being revised to form a protected zone policy based on priorities. First priority is private property, with up to five priorities which will include natural resources, trapping and hunting areas and wilderness areas. It is expected that the initial attack approach will be in general use, although in a year of extreme fire hazard limited resources will preclude a full scale attack on all fires.

Land Administration Section

1972 will see the transfer of the responsibility for lease granting and sale agreements in the Northwest Territories to the office of the Supervisor of Lands at Yellowknife. Similar authority has already been vested in the Supervisor of Lands at Whitehorse. This will be coupled with a delegation of signing authority to the Regional Director of Resources to execute all land transaction documents on behalf of the Minister.

During 1972 the Section will be embarking on a comprehensive review of all policies and regulations governing all aspects of the administration and disposal of lands in the Territories. It is expected that this review will result in a number of changes in policy and recommendations for revisions to the Territorial Lands Act, the Territorial Lands Regulations and the Territorial Quarrying Regulations.

Economic Staff Group

Responsibilities

The Economic Staff Group provides advice on the northern economy to senior departmental management and undertakes research and studies on matters which relate to the economic development of the north.

Functionally, the group is divided into two sections. The Resources and Transportation Section is concerned with the development of renewable and non-renewable resources, and transportation systems in the north and undertakes research and studies in this connection. The Regional Planning and Manpower Section is responsible for conducting research and studies on problems related to regional economic and policy planning, and pertaining to demographic and labour force matters arising from the development of northern industry and the employment of northern residents.

Review of 1971 Operations

During 1971 the Economic Staff Group conducted many research projects and studies, and undertook several projects with private consultants on behalf of the department. These projects covered a variety of subjects, but the formulation of a strategy for the development of the northern territories and the establishment and pursuance of national objectives with respect to the north continued to be accorded top priority in the group's work program.

The Resources and Transportation Section performed several feasibility studies, while most of the research undertaken by the Regional Planning and Manpower Section was designed to extend work on the strategy for northern development and to provide information and research results which would be useful in the process of implementing the strategy.

Research Projects Carried out or Directed by the Group

A) Projects by officers of the group:

- Yukon manpower survey to provide data on northern residents.
- An economic appraisal of constructing a fish processing plant at Hay River, NWT.
- A benefit-cost analysis of the proposed Fort Providence Bridge.
- A study of the location of industry in the NWT, based on an analysis of the resources of the area.
- A study of the skill and educational requirements for employment in industry in the north.
- Assembly of data on personal expenditure patterns in the north.
- A study of an input-output model for the District of Mackenzie, NWT.
- A study of the supply of and the demand for labour in the Yukon and the Northwest Territories.
- Studies of the movement of mineral products by highway in the Yukon.

B) Projects by contract employees:

- An economic evaluation of Indian and Métis employment at Pine Point, NWT.
- A study of possible transportation alternatives in the Mackenzie valley over the next 15 years.
- Analysis of the socio-economic impact of large diameter pipeline construction, operation and maintenance in the Yukon and Northwest Territories (a joint study by the consultant and the group).
- Design and application of a system of regional accounts for the north.
- Benefit-cost analysis of training programs for northerners.
- Development of indices to measure social change in the north.

Plans for 1972

Projects to be undertaken by the group or on behalf of the group in 1972 and in the foreseeable future are all geared toward achieving the following goals:

- To work towards the development of a broad strategy for northern development.
- To study specific northern industries and sectors of the economy which are critical to northern development.
- To recommend policies for northern development and methods by which policy aims are realized.
- To develop models which enable policies, programs and policy instruments to be tested and modified.

- To develop an accounting framework for the assembly of data on the northern territories.
- To develop indicators which may be used to measure the achievement of goals by government and the private sector in the northern economy.
- To undertake studies of transportation or resource development which could have a substantial regional impact on the northern territories.

Northern Science Research Group

Responsibilities

To sponsor and conduct research into human problems of northern development; to encourage and support such research by non-government agencies; to collect and disseminate scientific information, and to operate the Inuvik Research Laboratory.

Long-term Plans

To assist in the development of the Canadian north by encouraging scientific investigation; to provide advice and research services to organizations within the department; to co-ordinate the collection of information on Arctic developments outside Canada; to formulate detailed research plans and to arrange their implementation.

Review of 1971 Operations

Northern research continued in 1971 with an increased emphasis on work related to problems of social change for native people in the north and in particular on the possible effect of pipeline construction. A considerable portion of research during 1971 was done by university scientists and graduate students working under contract or in seasonal employment.

Research Projects Carried out or Directed by the Group

Projects by officers of the group:

- Examination of problems relating to aboriginal land claims in northern Canada.
- Summary of analysis of American proposals to resolve aboriginal land claims in Alaska.
- Analysis of trapping and hunting economy of Banks Island with reference to the use of resources and environmental problems.
- Historical list of Arctic trading posts, 1870-1970 with explanatory text.
- Inventory of municipal services in settlements of NWT. Continuing in 1972.
- Selective bibliography of water supply and waste disposal methods in cold climate regions.
- Modernization in Greenland, a study of the Danish approach to urbanization, and a comparison with Canadian experience.
- CANADA – USSR co-operation in northern exchanges.
- Socio-economic and technical research on the circumpolar countries in comparison with Canadian north.
- A preliminary study of the responses of northeners to the prospect of a pipeline.
- A preliminary study of potential impact of the pipeline on community organization and leadership patterns.
- A preliminary study of the social costs and benefits of short-term employment in the construction phase of large-scale development.
- Problems of modernization for native people in the north. Continuing in 1972.
- Preparation of a history of the Indian and Eskimos of Arctic Canada. Continuing in 1972.
- One officer represented NSRG as sociology instructor at the Arctic Summer School, Inuvik, NWT. Organized by the Boreal Institute.
- Analysis of the writings of explorer – missionary Emile Petitot concerning the aboriginal peoples of the Mackenzie delta.

Projects by contract employees:

- Study of the Indian community of Whitehorse. Continuing in 1972.
- Preparation of a summary and analysis of social indicators for the Mackenzie delta region of the NWT.
- To investigate the social dimension in utilization of the Barren Ground Caribou.
- A study of occupational aspirations among students in high schools of the NWT.
- Preliminary survey on the feasibility of compiling an Arctic sanitary engineering bibliography and report on municipal services in the Yukon. Continuing in 1972.

Grants Program for Northern Research Institutes and Scientific Research Expeditions

In 1971, the tenth year of this program of assistance to institutes and expeditions, amounts totalling $275,000 were awarded, as recommended to the Minister by a grants committee. Through these grants, a large number of northern research projects were supported in a wide variety of scientific disciplines. Grants were made to:

Arctic Institute of North America
Arctic Studies Group (Université de Montréal)
Boreal Institute (University of Alberta)
Centre d'Études Nordiques (Université Laval)
Committee on Northern Studies (University of Manitoba)
Committee on Arctic and Alpine Research (University of British Columbia)
Institute for Northern Studies (University of Saskatchewan)
Committee for Arctic & sub-Arctic Research (University of Toronto)
Arctic Studies Conference (Université Laval)
Institute of Social and Economic Research (Memorial University)
McGill Committee for Northern Research (McGill University)
The Devon Island Expedition (Arctic Institute of North America)
The Icefield Ranges Research Project (Arctic Institute of North America)
The University of Ottawa.

Grants for Applied Research, Meeting Specific Requirements of this Department

These grants were initiated in 1969-70. Their purpose is to support research in problem areas specified by the Department of Indian Affairs and Northern Development. $75,000 was allotted in 1970-71.

A grant of $30,000 has also been made to the Arctic Institute of North America for the publication of the Arctic bibliography. Research supported by the applied grants program continues into the following year.

The Scientific Research Laboratory, Inuvik, Northwest Territories

This laboratory, opened in 1963, provides general laboratory and other facilities to support a variety of scientific disciplines. The laboratory includes a cosmic-ray measurement annex, low-temperature rooms, photographic dark room, library, seminar room, offices and general or special laboratories. The laboratory lent support to approximately 250 investigators and 200 scientific

projects, and provided 2,500 accommodation-bed nights. Several abandoned DEW line stations have been renovated for use as scientific research units.

Plans for 1972

To continue to develop programs of research directed toward the human problems of northern development, and in particular to place an increasing emphasis on assessment of the potential social impact of pipeline construction in the north.

TERRITORIAL AFFAIRS BRANCH

Territorial Division

Responsibilities

- To act for the federal government in the negotiation and administration of federal-territorial financial agreements with both Territories.
- To review fiscal and legislative policies and development plans for both the Yukon and Northwest Territories and to advise the deputy minister on matters relating to the administration of the Territories.
- To co-ordinate the work of the Department of Indian Affairs and Northern Development and the governments of the Yukon and the Northwest Territories in all federal matters not related to natural resources.
- To advise the commissioners of the Yukon and the Northwest Territories on matters of government administration in the two Territories.
- To co-ordinate the transfer of provincial-type services under the jursidiction of the federal government to the governments of the Yukon and the Northwest Territories.
- To co-ordinate relations between the Territorial governments and other departments and agencies of the federal government on matters affecting areas of Territorial responsibility.

Long-term Plans

To develop long-term federal-Territorial policy and financial arrangements with both the Yukon and the Northwest Territories and to assist the governments of the two Territories in the exercise of their responsibilities and in the development of a more responsible form of government. To support Territorial fiscal programs and legislative policy proposals.

Review of 1971 Operations

The transfer of provincial-type functions performed by federal government departments to the two Territorial governments continued under the overall co-ordination of the division. The transfer of responsibility for administering justice in the two Territories was completed on April 1. The transfer had been authorized by Parliament in 1970 through amendments to the Yukon Territory and Northwest Territories acts. A comprehensive cost-shared legal aid program was introduced in the Northwest Territories. Arrangements were completed for the Yukon Territorial Government to assume responsibility for maintaining the Yukon section of the Alaska Highway and the Canadian section of the Haines Road. The division also helped establish Medicare in the Northwest Territories in 1971 and completed arrangements to introduce it in the Yukon on 1 April 1972.

The Northern Rental Housing Program in the Northwest Territories, which is administered by the Territorial government on behalf of this department, provided 120 new three-bedroom houses for Indians and Eskimos.

Under the Small Business Loans Program 17 loans totalling $333,400 were granted to small-business men in the Yukon.

In the Northwest Territories 17 loans were approved for a total of $385,058.20.

Financial assistance for the governments of the Yukon Territory and the Northwest Territories was appropriated in 1971-72 in the following amounts:

a) Financial Agreements

	Yukon Territory	Northwest Territories
Operating deficit grant	$6,890,000	$48,865,000
Capital loans	5,009,000	16,381,000
Amortization grant	2,635,800	3,194,000

b) Additional Financial Assistance Outside the Agreements

Yukon Territory	
Grant — administration of justice	$433,000
Contribution — Special employment plan projects	100,000
Contribution — hospital care of Indians and Eskimos	100,000
Contribution — Medicare for Indians	90,000
Contribution — 1st mortgage low-cost housing subsidies	20,000
Low-cost housing mortgage loans	260,000
Second mortgage loans to residents	50,000
Northwest Territories	
Contribution — special employment plan projects	$100,000
Contribution — hospital care of Indians and Eskimos	774,000
Contribution — Medicare for Indians and Eskimos	340,000
Contribution — 1st mortgage low-cost housing subsidies	10,000
Territorial rental housing loan	900,000
Contribution — toward Eskimo acquisition of boats	15,000
Loans to third parties	1,503,000

The division co-ordinated the negotiations for federal-Territorial financial agreements to commence 1 April 1972 for both Territories.

Plans for 1972

The administration, co-ordination and supervision of a one-year financial agreement which commences 1 April 1972 for both Territories to be carried out under the following terms:

	Yukon	N.W.T.
Operating grant	$6,754,000	$51,526,000
Grant-in-lieu of income taxes	3,687,000	5,049,000
Amortization grant	2,932,000	4,797,000
Capital loans	6,869,000	19,660,000
Loans for relending to third parties	400,000	1,155,000

Research is being done into possible new procedures for federal financial assistance to the Territorial governments.

Northern Services Division

Responsibilities

The Northern Services Division co-ordinates the administration of special programs for Eskimos and other northern residents, either on behalf of the Government of the Northwest Territories or representing residual federal responsibilities.

The division has four major sections: the Eskimo Services Section, the Education Section, the Employment Liaison Section, and the Indigenous Claims Section.

The Eskimo Services Section provides specialist advice on diverse matters relating to Eskimos and northern responsibilities generally. These include a translation service in the Eskimo language, the publication of an Eskimo magazine and also, through its fine arts group and the use of the department's arts and crafts collection, the promotion of Canadian-Eskimo art and culture. In addition the Eskimo Services Section administers the Eskimo Loan Fund, the Eskimo Small Boats Grant Assistance Scheme and provides assistance to Canadian Arctic Producers Limited, a central marketing agency for northern arts and crafts.

The Education Section provides a staff of specialists responsible for counselling, training arrangements, relocation and employment assistance for Eskimos in southern Canada. It also operates the departmental education facilities at Fort Churchill, Manitoba, and the Eskimo Language School at Rankin Inlet, NWT.

The Employment Liaison Section provides contact with resource development industries, labour unions, federal departments and Territorial government, to ensure that northern residents, particularly the native people, have every opportunity to share in and benefit from the development of the north.

The Indigenous Claims Section conducts intensive research and prepares position papers on claims by the indigenous peoples of the NWT and the Yukon Territory.

Long-term Plans

The Northern Services Division will continue to provide specialist advice on various matters relating to Eskimos and the north in general. The division will place more emphasis on Eskimo cultural development, and will strive to obtain the Government's objective of increased training and employment opportunities for northern residents. It will also examine claims of indigenous peoples based on a concept of aboriginal title and conduct studies aimed at establishing major commercial enterprises in the north.

Review of 1971 Operations

1971 saw the continued operation of the Eskimo Loan Fund with $157,649.40 in loans being approved. The Canadian Eskimo Arts Council was further supported in the mounting of a major international Eskimo art exhibit (the Masterworks of the Canadian Arctic) to be shown in France, Denmark, the USSR, the UK and the United States. The departmental collection of Eskimo art was shown in a number of places both at home and abroad. A scheme was developed to help northern Indians and Eskimos assume ownership and control of Canadian Arctic Producers Limited. During the year the company acquired new and larger warehousing facilities.

The operation of the federal school complex at Fort Churchill continued, as well as an Eskimo language school at Rankin Inlet. The school complex had an enrolment of over 200 students and counselling and placement people provided a service to over 200 students in southern Canada. The Employment Liaison Section monitored agreements for the employment of northern residents with Pine Point Mines, Canada Tungsten and Anvil Mining.

Plans for 1972

The Northern Services Division will continue to administer and improve programs. The Employment Liaison Section will establish, at Churchill and Frobisher Bay, committees with representatives from government, industry and local residents to discuss ways and means of creating more training and employment opportunities for northern residents, especially native people.

DEPARTMENT OF JUSTICE

Responsibilities

To appoint judges to the Territorial courts, and direct and conduct court proceedings on behalf of the Corwn, including prosecutions under the Criminal Code of Canada and other federal statutes. The department also has a shared responsibility for the cost of legal aid in the Northwest Territories.

Review of 1971 Operations

An agreement was signed between the Minister of Justice and the Commissioner of the Northwest Territories, establishing a shared-cost legal aid program to provide aid in both criminal and civil cases. Discussions are going on with the Government of the Yukon Territory with a view to establishing a similar system.

Plans for 1972

Responsibilities of the Department of Justice will continue as at present and, effective 1 April 1972, arrangements will be made for the appointment of an additional Crown Prosecutor in both the Northwest Territories and the Yukon Territory.

DEPARTMENT OF MANPOWER AND IMMIGRATION

Responsibilities

The aim of the department is to further the economic growth of Canada by endeavouring to ensure that the supply of manpower matches the demand qualitatively, quantitatively and geographically; and to assist in the development of the Canadian economy by encouraging a flow of desirable immigrants, adaptable to the needs of the country, and by controlling the entry into or stay in Canada of non-immigrants.

Long-term Plans

The services of the department will be extended to people living in outlying areas who, at present, are not able to benefit fully from them. Itinerant services are proposed for these remote areas.

The continuing long-term plans of the department's northern offices are to determine the manpower needs of employers in the north and to arrange for suitable training courses for workers resident in the north in order that their skills might be acceptable to these employers.

Review of 1971 Operations

General

Three full-time offices at Whitehorse, Yellowknife and Inuvik provided service to employers and workers in the far north. In addition, itinerant service was provided to such communities as Fort Smith, Coppermine, Chesterfield Inlet and others.

A total of 13,583 workers and employer clients requested assistance in 1971, either to seek employment or to recruit workers. Of the persons seeking work, 4,005 were placed in employment. Workers were assisted under the Canada Manpower Mobility Program to travel to training institutions, and to either explore or accept jobs outside the Territories. However, many lacked the basic education or skills to take advantage of opportunities. Consequently, the provision of counselling continues to be of prime importance because of the very special problems of people living in isolated communities where experience of modern industry is, at least, limited and superficial.

Training

In 1971 training courses were available in both the Yukon Territory and the Northwest Territories. Courses geared to present and future economic needs are producing graduates trained as heavy-equipment operators, welders, carpenters and clerk-typists, to name a few. Moreover, there has been a substantial increase in settlement-based training, particularly in the Basic Training for Skill Development and Basic Industrial Skill Courses. In the Basic Trades Training, there has been a slight increase over the previous year. Some new courses have been introduced, such as mineral identification and polar bear hunting. There was also marked activity in Training-in-Industry Programs, particularly as they relate to transportation and government services.

In the north there is an acute awareness of the lack of skilled workers, making employers receptive to the training-in-industry concept which is implemented through the Canada Manpower Training Program. Under this program employees have been exposed to industry-based courses, many of which were related to the primary industries, transportation and government service.

Vocational Rehabilitation

In February 1971 the department entered into the Vocational Rehabilitation of Disabled Persons Agreement with the Territorial governments; the main purpose of which is to provide comprehensive rehabilitation services to disabled persons, ranging from assessment and counselling to intensive training. This program has resulted in increased service to the disabled and closer contact with agencies and the Department of Manpower and Immigration.

Frobisher Bay

Frobisher Bay is receiving itinerant service from the Yellowknife Canada Manpower Centre. Basic Training for Skill Development is the most common form provided to clients from this community.

Immigration Activity

In 1971, of the total persons admitted to Canada as immigrants, 183 gave their destination as being either the Yukon Territory or the Northwest Territories. Of this number, 97 were destined for the labour force and the remainder (86) were dependents.

Jurisdictional and Operational Responsibilities

During 1971 jurisdictional and operational responsibilities for departmental services in the Canadian north were as follows:

- The area officially defined as the Yukon Territory is under the jurisdiction of the Director General, Pacific Region, Department of Manpower and Immigration, 1155 West Pender Street, Vancouver 1, B.C.
- The area officially defined as being in the Northwest Territories, i.e., the districts of Mackenzie, Keewatin, and Franklin, is under the jurisdiction of the Director General, Prairie Region, Department of Manpower and Immigration, 1200 Portage Avenue, Winnipeg, Manitoba, R3G 0T5.
- The Director General, Quebec Region, Department of Manpower and Immigration, 550 Sherbrooke Street, West, Room

524, Montreal 2, Quebec, is responsible for the area in northern Quebec.

Plans for 1972

Yukon Territory

Increased emphasis will be given to expansion of the Canada Manpower Services to Employers Program, which is designed to meet the employment service demands of employers and to broaden the department's penetration of the labour market.

Services to Youth will again receive a high priority and students will be hired to assist the Canada Manpower Centre staff in servicing youth seeking part-time or temporary employment.

Northwest Territories

General

The main emphasis in 1972 will be on reaching as many employers and workers in settlements as possible. There will also be stress on working closer with the various organizations concerned with manpower development in the north. In addition, employers will be encouraged to be more active in follow-up training and counselling of workers.

Due to anticipated extensive exploratory drilling for oil and the construction of a pipeline, it is of prime importance that northern residents receive the full benefit of training. The present poor education of many northern residents calls for a special effort to provide adequate training. There will also be continued emphasis on counselling, on both group and individual basis, in order to reach as many people as possible, and to bring to bear the full range of departmental services.

Frobisher Bay

It is expected that itinerant services to Frobisher Bay and some other communities of the eastern Arctic will be expanded.

DEPARTMENT OF NATIONAL DEFENCE

CANADIAN ARMED FORCES

Responsibilities

The Canadian Armed Forces are responsible for:

- the support of Canada's national policies by contributing to the maintenance of Canada's sovereignty;
- all aspects of maritime, land and air defence (in some areas these tasks are carried out in co-operation with our allies under international agreements);
- operation of rescue co-ordination centres, and the provision of aircraft search and rescue services;
- assisting other government departments and civilian agencies in national development projects, and in time of civil emergencies.

Long-term Plans

Within the context of these responsibilities the Department of National Defence will increase the scale of its activities in the Canadian Arctic. It has already embarked on a continuing surveillance of Arctic lands and waters, and is training troops to live, work and fight in both summer and winter Arctic conditions. In support of these operations, it has tested its ability to deliver airborne troops to isolated parts of the Arctic and to operate fighter aircraft in the north. Its transport operations are increasing, and it is co-operating with other government departments to improve the number and size of operational airstrips in the Arctic. During the past two years its naval forces have again started penetrating the Arctic seas with large ships. Recruiting of northerners for the Canadian Forces has started on an organized basis, and a meaningful role for the Canadian Rangers is being worked out. Co-ordinating all these activities is the new Northern Region Headquarters at Yellowknife.

Review of 1971 Operations

Maritime Forces

There was considerable naval activity in Canada's northern waters and airspace, largely in the surveillance role.

During the 12-month period Argus aircraft flew 43 missions into the Arctic for a total of 2,029 flying hours, and Tracker aircraft flew 290 hours on northern coastal patrols. The Argus aircraft flew from northern bases at Frobisher, Yellowknife, and Whitehorse, while the Tracker operated from Goose Bay and Frobisher Bay for surveillance of the coastal regions. A Maritime Command detachment was established at Frobisher Bay. Scientists and observers from other government departments were frequently on board these aircraft for special projects.

In August, a naval task force, composed of HMC Ships *Preserver, Assiniboine,* and *Margaree,* with a helicopter detachment on board, deployed for three weeks into Arctic waters. They visited Povungnituk, Ivugivik, Sugluk, Wakeham Bay, Rigolet and Nain. During the voyage they were in contact with the Canadian Rangers in Labrador and northern Quebec, and carried out surveillance of foreign fishing trawlers in the Davis Strait. The medical officer from *Preserver* examined more than 160 patients and the dental officer attended a further 73 northern residents.

The ships also visited Frobisher Bay, Godthaab and Sondrestrom in connection with the visit of the Minister of National Defence to Greenland. During this phase of the voyage the ships conducted exercises north of the Arctic Circle, the first in our maritime history.

Shortly after, on the western side of the Arctic, HMCS *Provider,* HMCS *Qu'Appelle* and the submarine *Rainbow* were on an exercise off Alaska when Societ cruiser, two destroyers, three submarines, a submarine tender and a tanker were encountered. The Canadian ships were joined by an American group and the excercise became a surveillance operation. The Canadian and American ships and aircraft kept a watch on the Soviet units through the Aleutian chain, the Gulf of Alaska and south toward Hawaii.

At National Defence Headquarters in Ottawa a study was made of the long-term needs for Arctic and coastal surveillance. Also considered was the need for long-range maritime patrol against surface and subsurface vessels.

Land Forces

The scope of land force operations, training and manoeuvres expanded considerably during 1971.

Probably the biggest single advance was the establishment of Northern Region Headquarters at Yellowknife in the Northwest Territories, with a detachment at Whitehorse. It is important because it provides a permanent military co-ordinating authority in the north, close and continuing liaison with the Territorial governments, and a central data unit for military and civilian agencies who need information to operate in the north.

Northern Region is one of the six designated military regions of Canada and is geographically the largest. It comprises the Yukon Territory and the Northwest Territories, including the islands in Hudson Bay and James Bay, the islands of the Arctic archipelago, and extends to the geographic North Pole. The area is more than 1,500,000 square miles, representing 40 per cent of Canada.

The commander of the Northern Region co-ordinates the activities of the forces of other commands when they are deployed in

the north. Only the units, personnel and material of the forces assigned solely to northern activities are based permanently in the north.

One continuing series of sub-unit exercises, which has been going on for the past three years, is called New Viking. These exercises are designed to prepare ground forces for surviving, working and fighting in summer and winter Arctic conditions. Apart from providing an almost continuous military presence in the north, they had by the end of December familiarized some 2,200 officers and men with the geography, terrain, climate, and operating difficulties from Churchill to the most northerly islands of the Arctic archipelago.

Headquarters and main support base for Exercise New Viking are at Churchill. Advanced bases during the winter are established at such points as Baker Lake, Coral Harbour, Rankin Inlet, Frobisher Bay and Yellowknife. In the summer, they are transferred to Sachs Harbour, Mould Bay, Isachsen, Ray Point and Eureka.

During the same period, a field survey was completed by 71 specialists from the Directorate of Mapping and Charting. The survey, code-named *Arctic 71*, will eventually lead to the production of 347 tactical maps to a scale of 1/50,000 covering an area of 75,000 square miles from Coppermine to Melville Peninsula. The operation was supported by three military CH–113A Voyageur helicopters which logged 5,000 miles and positioned 500 drums of fuel for the civilian helicopters carrying survey parties.

Further north, members of the Canadian Forces manned the satellite triangulation stations at Cambridge Bay and Frobisher in co-operation with the Satellite Triangulation – North American Development Program.

In the Yukon, members of 3 Field Squadron, Royal Canadian Engineers constructed a steel and concrete bridge across the Olgilvie River at mile 123 on the Dempster Highway, which will help to open up new road links for the vast region of the Mackenzie River delta up to Inuvik.

While the introduction of more sophisticated means of detecting aircraft, and better communications have reduced the usefulness of the Canadian Rangers in their original role, this group of unpaid reserve militiamen has continued to prove its worth in recent years in a variety of ways. A study of the Rangers was made to consider how they might best serve Canada under the new conditions. As part of Northern Region's study, two Ranger field training exercises were conducted in 1971, one at the remote Arctic settlement of Holman Island on the west shore of Victoria Island and the other at Frosbisher Bay in the eastern Arctic.

As a stated policy, the Department of National Defence is encouraging young northerners to join the Canadian Forces, and is helping other government departments to train still more for the new era in the north. Recruiting teams from Edmonton, Winnipeg and Montreal visited all major Arctic communities in the spring of 1971 to enrol young northern Canadians who have a knowledge of the Arctic and sub-Arctic regions. The current recruiting target for the northerners is 100 for a variety of trades, and nine had been enrolled by December.

In addition, Training Command provided aircraft mechanic, heavy equipment operator and home-handyman training for 22 young men and women from northern Canada at the request of the Department of Indian Affairs and Northern Development.

Air Forces

With many new tasks assigned to them, the air elements of the Canadian Forces continued to improve their ability to operate in the north, as well their flexibility for the future. The training included familiarization of new crews with the remote Arctic airfields, increased practice in the techniques of air drops of troops and matériel, and a concentration on Arctic meteorology and navigation. The facilities included improved Arctic airstrips, fuel caches for helicopters and detailed studies of the future requirements of long-range aircraft for surveillance.

Air Transport command continued to provide weekly air service to the Canadian Forces communications stations at Alert (routing from Trenton, Ontario, through Thule in Greenland, to Alert, and back through Resolute Bay to Trenton), and at Inuvik (routing from Namao, Alberta, through Yellowknife to Inuvik, and back through Yellowknife to Namao). The aircraft used was a C–130E Hercules.

Air Transport Command also provided airlift for the annual resupply of Canadian Forces Station, Alert with flights staging through Thule, during which a total of 117 loads of fuel oil and general cargo were flown in by Hercules aircraft.

Air Transport Command is also responsible for search and rescue for the whole of Canada, including the north. The four squadrons searched for 98 missing aircraft in 1971 and helped to save 193 lives. A total of 8,628 hours was flown in search and rescue missions. Five major searches were conducted north of the 60th parallel, entailing about 225 flying hours during the year. Search and rescue flights are operational missions demanding skill and determination. An aircraft and eight crew members were lost in an attempt last November to drop supplies to a downed pilot in the Arctic barrens.

A standing detachment of two Twin Otters from 440 Squadron in Edmonton was assigned to Northern Region headquarters during the year. It will provide direct communications with settlements and development sites within Northern Region, and will also augment the search and rescue capability in the north, and perform mercy flights.

Providing a long-term military presence in the Arctic, the DEW Line consists of four main and 18 auxiliary radar sites which are strung across the Canadian Arctic from Cape Dyer in the east to Komakuk Beach near the Alaskan border.

For the first time in many years, Canadian Forces fighter aircraft appeared in Arctic skies. Quite different in both role and capabilities from Canada's long-range interceptors of Air Defence Command, CF–5 tactical fighters of Mobile Command took part in Arctic exercises in February. While a detachment of 434 Squadron from CFB Cold Lake, Alberta, operated out of Whitehorse in the Yukon, four CF–5s from *433e Escadrille tactique de combat*, CFB Bagotville, carried out 30 exercise missions over Baffin Island in the eastern Arctic. Supported by a Hercules, four of these attack/photo-reconnaissance aircraft were successfully staged through Fort Chimo near Ungava Bay, to Frobisher. During the four days of missions flown out of this airfield, the CF–5s penetrated some 250 miles beyond the Arctic Circle.

During the summer two Air Reserve squadrons moved north for their annual training. No. 402 "City of Winnipeg" Squadron operated out of a forward base at Yellowknife and 418 "City of Edmonton" Squadron operated out of Norman Wells. In addition to their training, they flew far-ranging reconnaissance and pollution survey missions. They inspected and photographed six abandoned DEW Line sites, oil exploration bases, pipeline routes and abandoned airstrips for the Northern Region commander.

To handle all this renewed air traffic, and to help open up Arctic settlements to year-round traffic, work continued on the six new and improved airstrips in co-operation

with the Department of Indian Affairs and Northern Development. The airstrips are being built by military engineers and heavy-equipment operators from CFB Winnipeg, with the help of local labour. The strip at Pangnirtung, 2,600 feet long and 150 feet wide, will be ready for use in September of this year. The facility at Whale Cove is 4,000 feet long and able to accommodate large military transports. Work there is expected to be finished by August 1972. Similar airstrips at Cape Dorset, Pond Inlet, Igloolik and Chesterfield Inlet will be ready in 1973.

Plans for 1972

General

Commensurate with the department's objectives and activities in the Candian north, a three day conference was conducted during February 1972, to which delegates from eight other governments were invited to attend. One of the major conclusions reached during this conference was the need for close co-operation and co-ordination between various departments in the achievement of the national aim. Similar conferences are planned for 1972-73 but on a reduced scale.

Maritime Forces

Current plans calls for a naval task group including Maritime Command aircraft to conduct exercises in northern waters and to continue Arctic and northern coastal patrols on a scale similar to 1971 operations. The Maritime Command will continue to support other federal departments and agencies to the greatest extent possible, consistent with the primary tasks and resources now assigned.

Land Forces

The New Viking series of exercises will continue. In addition several major environmental training exercises will be conducted out of Churchill and Resolute Bay.

Air Forces

Hercules aircraft will continue to fly regularly to Alert and Inuvik and Hercules and Buffalo aircraft will be used extensively in support of land forces environmental training. Two Twin Otter aircraft will continue to be flown from Yellowknife to serve NRHQ.

Two CF–5 Squadrons will support four scheduled FMC land exercises in the north during 1972. In addition the squadrons will occasionally be assigned to operations from northern airfields.

DEFENCE RESEARCH BOARD

Responsibilities

To bring to the Canadian Armed Forces scientific knowledge and experience in solving problems associated with military operations in high latitudes, and to sponsor and undertake research projects aimed at acquiring such knowledge.

Long-term Plans

Research will be conducted both in the laboratory and in the field. Almost every aspect of science is involved, and for convenience the work is categorized as follows:

- Research on the effects of the environment on systems used by the Canadian Forces to generate and transmit information necessary to command and control, and on the effects of the environment on the CF's ability to conduct operations in the north.
- Research directed to protecting the soldier and his equipment from the environment.
- Research directed to the protection of the environment from military operations.

Review of 1971 Operations

Research was conducted at the board's laboratories across the country; these studies are functional and multi-disciplinary. The board also supported research in the north by means of grants and contracts to universities and non-government research organizations, and by providing facilities and goods and services to other government agencies. Close collaboration was maintained with research and development agencies in other countries, especially the United States and Great Britain.

Remote Sensing in The Northern Environment

Two surveys were completed in 1971. One was a statistical study of the distribution of particulates and precipitates in the Arctic atmosphere and their effect on the transmission of those portions of the electromagnetic spectrum used in remote sensing. The other was a survey of the possible application of pattern recognition techniques to the processing of imagery obtained in Arctic surveillance overflights. Both of these surveys bear on longer-term research to determine the spectral properties of background and target materials at ambient Arctic temperatures and to develop devices to give real-time display in aircraft. A Fourier transform spectrophotometer has been obtained for the work on spectral signatures.

Shorter-term work involved direct support for the Canadian familiarization trials of infra-red line scanning equipment (IRLS). Two calibration target arrays have been built, and IRLS imagery over them has been obtained and is being processed in the laboratory to determine the modulation transfer function of the equipment as well as other parameters, such as the temperature difference resolution capacility. A liquid nitrogen transfer unit, which allowed extension of the detector operating time of the Reconofax XIII–A equipment from approximately two hours to 11 hours, was designed for in-flight use. The work on remote sensing is being done at the Defence Research Establishment, Ottawa (DREO) and the Defence Research Establishment, Valcartier (DREV). The research support of Canadian Forces remote sensing work in early 1971 will continue in 1972 and will be extended to include sideways-looking airborne radar. This sensor will become operational in early 1972.

Arctic Acoustics

The gathering of acoustic data in northeastern Arctic waters continued in 1971. Two DRB establishments, the Defence Research Establishment, Atlantic (DREA) and the Defence Research Establishment, Pacific (DREP) were involved. In late summer of 1971 scientists from DREP and DREO, together with those from the Ministry of Transport and the Department of the Environment, sailed aboard the CGS *Louis St. Laurent* to Nares Strait where a number of acoustic and other parameters were measured. Acoustic propagation and bottom reflectivity were measured, and data on the water depth and structure (temperature, salinity and oxygen content) were obtained, as were bottom cores. DREA's research ship CNAV *Ouest* sailed as far north as 65°, gathering data on propagation and reverberation, while air-deployed modified sonobuoys were used farther north in Baffin Bay to gather similar data. The ambient noise and reverberation data obtained indicate interesting differences between this area and the open Atlantic. In 1972 *Ouest* will go as far north as Smith Sound to check the results obtained by air-deployed sonobuoys using ship-deployed experimental systems that are not only quieter but have greater directivity. Also in early 1972 advantage will be taken of a winter cruise by CGS *Louis St. Laurent* to the Smith Sound area to obtain under-ice environmental parameters.

Effects of Environment on Military Radar and Communications

This work is financed by DRB and done under contract by the Communications Research Centre, Ottawa. Radar problems were concerned with the possibility of extending present coverage in the north, and basic field experiments have been started on environmental limitations in the use of over-the-horizon-radar systems as well as on means of extending operations during conditions of disturbed propagation. Actual measurements will begin in 1972. The work on military communications has included propagation measurements in the north using the satellite system with a terminal at Resolute and construction of a second transportable terminal. This military work could be of considerable value to civil communications in the north.

The Effects of the Environment on Mobility

Work on mobility has been done through outside grants, contracts to universities and in-house. The former includes continuing studies of the physics of soil-wheel interaction, the use of photogrammetry and codifying of terrain for military use, investigation of the physical and engineering properties of ground in permafrost regions, and studies of transportation networks in the north. Support of this type of work will continue in 1972.

In-house work at DREO was concerned with a parametric study of the energy budget of small groups of men operating in the Arctic. Basic equations to fit a variety of scenarios have been developed, as well as a hypothetical vehicle-shelter unit. Comparisons have been made of actual scenarios using both equipment in inventory and the hypothetical unit. They indicate that the hypothetical vehicle-shelter concept of operation involves lower energy consumption, and this concept will be further investigated in 1972.

Other studies on the effects of the environment on mobility were concerned with the movement of sea ice in channels of strategic-economic interest and the growth and decay of ice masses in the fiords and deep sounds of Ellesmere Island. The Ellesmere Island study is also indicative of long-term climatic trends in the area and thus of ice conditions. In the former work the ice conditions in Nares Strait were monitored using radar, augmented when possible by visual observations in a series of overflights during the dark period. It was established that consolidation of the ice did not occur until late February. The data obtained correlated with fragmentary observations of historical explorers on foot and indicated that this late consolidation is not unusual. The North Water, a large open-water polynia at the head of Smith Sound, was also observed during this period. This type of ice reconnaissance will be continued in 1972 to help better establish "average" conditions, and it is anticipated that some flights will be made using IRLS in an attempt to resolve ambiguity in the radar returns from this smooth ice and open water.

Protection of The Individual Soldier from The Environment

This study covers both the physical and the physiological approach to protecting personnel in the north. In the former the shelter-transport unit concept referred to under Mobility is being investigated as a means of moving personnel and protecting them from the environment. In addition, a number of aspects of clothing design will be investigated. DREO, where the work is being done, has been in contact with the other large group active in the north, the Arctic Petroleum Operators, and with them DRB is conducting a joint evaluation of protective clothing and examining the problems. It is felt that the concerns of the Arctic Petroleum Operators are similar to DND's in that hand protection, with a minimum compromise of dexterity, and better face protection are of high priority in both cases. Work planned for the winter of 1972 will call for the use of selected items of clothing from the DND inventory at well drilling sites and the gathering of performance data.

The physiological work is being done at the Defence and Civil Institute of Environmental Medicine (DCIEM) as part of a continuing enquiry into the physiology of adapting to cold. The aim of this work has been to better select individuals for northern duty and to develop drug treatments that will promote better circulation and hence adaptation. Work in 1971 has shown that topical application of creams is of no benefit and there is strong suggestion that a high degree of physical fitness induces cold tolerance.

Other work on the effects of cold on the body's susceptibility to disease has shown that exposure to either acute or chronic cold does induce marked changes in the individual's immunological reactivity.

Work is also being done on peripheral adaptation to cold and the variations of this ability in individuals as demonstrated by differing susceptibility to frostbite. A study has been set up to examine frostbite casualties in the field to determine changes in peripheral circulation and seralogical structure. The study will attempt to explain why susceptibility apparently increases after frostbite. The aim of the DCIEM work is to quantify cold stress by producing a metabolic index that would measure individual susceptibility and help in personnel selection. Exercise New Viking candidates will be given physiological assessments before and after exercises to determine any correlation between preselection tests and incidence. All the physiological work being done will continue in 1972.

Work on the protection of troops in the north from infectious diseases includes examination of antibodies in paired sera from troops on exercises in the north and the examination of birds, mammals, etc. in areas of troop activity for disease organisms or vectors that would transmit infectious disease. The Defence Research Establishment, Suffield (DRES), where this work is being done, began obtaining blood samples from troops on New Viking northern exercises before and after their stay in the Arctic. No conclusions have been reached so far. Extramural research indicates the presence of chlamydial agents in northern wildlife.

The old northern problem of biting insects is being tackled extramurally through grants and contracts.

Protection of the Environment from the Effects of Military Operations

Study of this problem by the DRB is limited, reflecting both the newness of concern about damage to the environment and the fact that other departments are doing considerable research. Some specific problems are being tackled by DRES, including waste disposal and possible chemical pollution at Canadian Forces bases. A review of literature on waste disposal methods has been undertaken and a survey team from DRES examined funnel effluents and galley, sewage and laundry wastes from a Canadian Forces ship. Although liquid wastes has at times a BOD and coliform level above permissible limits, the ship would be a small source of pollution.

Other aspects of this type of work, for example the effects of disturbing ground and ground cover, are financed extramurally.

Military Engineering

A variety of topics ranging from work on power sources, especially their low-temperature output, to the use of explosive

or kinetic energy and chemical devices to penetrate frozen ground or ice are under study at DREO, DRES and DREV. Holes in the sea-ice are necessary for inserting instruments, while explosive ditching and cratering may be required in military operations. Results with slurry explosives indicate a potential use in northern construction. Exploratory work will continue on the effects of shaped charges made on site from slurry explosives.

The battery work is part of a continuing effort and in 1971 included: development of pressed-sintered silver electrodes for silver chloride batteries which give better low-temperature (down to -40°C) performance than conventional electrodes; development of an MnO_2-catalysed sintered nickel plaque for metal air batteries for low temperature use; development of a simplified method of impregnating carbon cathodes with MnO_2 for these batteries (these cathodes have given indications of better performance than a commercial type over the range -40°C to 24°C); work on the effect of cold soaking on hydrazine-air fuel cells; and further testing of magnesium-manganese alkaline batteries for transponders over the range -40°F to room temperature.

Operational Research

Operational research projects in support of military operations saw continuing work on the New Viking detection experiments. Results so far indicate that surveillance flights in good visibility (to 15 nautical miles at 1,000 feet above ground level) may fail to detect a group of 30 men on foot. Detection ranges greater than one or two nautical miles appear very unlikely. However, in reconnaissance flights a creeping line-ahead search with 21/2 nautical mile spacings between legs should find this target. Short detection ranges can be expected, but again ranges greater than one or two nautical miles appear unlikely. During 1972 this work will continue, using a wider variety of spotting aircraft. The work has implications for search and rescue in the north. Other studies were on the financial and technical feasibility for Canada of using satellite surveillance in the Arctic, and an assessment of the possible uses of air lift in developing the north.

Plans for 1972

The program for 1972 will be essentially an extension of the one discussed above under "Review of 1971 Operations", bearing in mind the need to keep activities relevant to the Long-term plans.

Grants

- To McGill University for research on the engineering properties of frozen soil.
- To McGill University for a study of deformation of ice at high reduction and strain rates.
- To McGill University for mapping Arctic sea ice from satellite photographs.
- To the Arctic Institute of North America for the Baffin Bay-North Water project.
- To Victoria University for model studies on reverberation from sea ice.
- To York Univeristy for work on the reaction of the constituents of the upper atmosphere.
- To University of Ottawa for a study of the preservation of permafrost by means of a two-phase thermosyphon.
- To University of New Brunswick for a national inventory of muskeg types.
- To Queen's University for research on the stability of airfield and foundation pads on muskeg.
- To University of Saskatchewan for a northern Canada transportation study.
- To the University of Saskatchewan for research on particle influx near the auroral zone.
- To the University of Saskatchewan for studies on western equine encephalitis virus in Saskatchewan.
- To the Royal Military College for research on evaluation and stabilization of highly compressive terrain for use as V/STOL aircraft landing sites.
- To the Royal Military College for research on the physics of metals in very low temperatures.
- To the University of Western Ontario for research on the physics of the troposphere as related to UHF radio transmission.
- To the University of Western Ontario for studies on VHF radio wave scattering in the ionosphere.
- To the University of Western Ontario for support of ionospheric studies using satellites.
- To the University of Manitoba for research on effects of adverse environmental conditions on intellectual and perceptual processes.
- To Laval University for a study of circulatory adaption to cold stress.
- To McMaster University for investigation of beach characteristics and nearshore processes in the Canadian Arctic.
- To McMaster University for research on shear strength of soft soils under repeated loads.
- To McMaster University for research on soil characteristics, terrain mapping and terrain analogues in Arctic areas.
- To the University of Guelph for orthophoto development.
- To Victoria University for studies of model reverberation from sea ice.
- To Memorial University of Newfoundland for studies of the iceberg cross section echo.
- To McMaster University for studies of photo interpretation and mapping in the Resolute area.
- To Dalhousie University for geophysical studies in Baffin Bay.
- To University of Calgary for isotropic studies of glaciers and high altitude precipitation.
- To McGill University for the measurement of water-drag coefficient of an ice cover.
- To University of Manitoba to study the zoogeography of northern Aedine mosquitoes.
- To University of Alberta to study insect flight behaviour in relation to the environment.
- To University of Manitoba to study the effects of temperature, energy availability and hypoxia on bioenergetics and metabolism in cold climate mammals.
- To Laval University to study adaptation to extremes of temperature.
- To Laval University to assess cold reactivity by autonomic system responses.
- To the University of Western Ontario to study metabolic reactions to dietary, temperature and traumatic stress.
- To University of Calgary to study the stabilization of Arctic sands.
- To Carleton University to study the effect of vibrations on off-road vehicle mobility.
- To the Royal Military College to study the thermal properties of helium in low temperatures.
- To University of Manitoba to study the magnetic properties of dilute alloys at low temperatures.

Contracts

- With McGill University for research on ice physics, with special reference to the study of sea ice.
- With McGill University for meteorological and geophysical work at Tanquary Fiord.
- With the Arctic Institute of North America to provide limited consultant work.
- With McGill University for a study of terrain evaluation and classification for mobility.
- With McGill University for a study of soil-wheel interaction in the use of off-road vehicles.
- With the University of Saskatchewan for studies in radiation effects and their relationship with composition, heating, and circulation in the stratosphere and mesosphere.
- With Queen's University for research on the suceptibility of black flies to DDT, including field residues.
- With the Bombardier Company to study the logistics of northern vehicles.
- With the Marconi Company to develop retransmission buoys to study ice drift in northern waters.

DEPARTMENT OF NATIONAL HEALTH AND WELFARE

MEDICAL SERVICES BRANCH

Responsibilities

Through its Northern Health Services, the Medical Services Branch of the Department of National Health and Welfare is responsible for developing total health care in the north. It plays a dual role in providing health services to all northern residents, acting in the capacity of a provincial health department for both Territories, the Territorial councils enacting health ordinances.

The governments of the Yukon and the Northwest Territories operate health insurance plans in much the same manner as do provincial governments elsewhere in Canada.

Medical care insurance became available to residents of the Northwest Territories on 1 April 1971 and it is expected that the Yukon will initiate its medical care plan on 1 April 1972.

Long-term Plans

Involvement of Northern Residents

Continual efforts will be made to gain the maximum participation of administrations and the northern populations in health care: by increased liaison with the Yukon and Northwest Territories, other federal departments, community groups and associations interested in health services; by encouraging more involvement of residents in hospital advisory boards and health committees; and by developing further para-medical, dental therapist and other health personnel training programs.

Environmental Health

Efforts will be made to establish a comprehensive, ongoing environmental health program in order to assure adequate water supply, and appropriate sewage and waste disposal systems to all communities in the north. This will require the services of public health engineers and support staff on a permanent basis. Plans are being made to organize a public health engineering service within Northern Health Services.

Nutrition

Results of the National Nutrition Survey should be available early in 1973. These will influence plans for future public health nutrition programs. Recommendations for nutrition guidance will be disseminated not only to medical services field staff but also to the Yukon and Territorial governments.

Research

This will include:

- Planning of research into the epidemiology of disease in northern populations.
- Co-ordination and review of research by non-government agencies when relevant to health conditions and problems in the north.
- Contact with Canadian universities interested in research, especially those engaged in health care in the Canadian north.

Review of 1971 Operations

Facilities

New facilities were being built or existing facilities improved as follows:

Started	*Completed*	*Name*
1970/71	1971/72	Lake Harbour nursing station
		Grise Fiord nursing station
		Resolute Bay transient trailer
		Belcher Island nursing station
		Coral Harbour transient trailer
		Fort Providence nursing station
		Hay River health office
		Fort Good Hope transient trailer and garage
		Fort McPherson nursing station
		Fort Norman transient residence and garage
		Baker Lake nursing station
1971/72	1971/72	Clyde River nursing station
		Broughton Island nursing station
		Resolute Bay doctor's residence
		Coral Harbour garage
		Whale Cove nursing station
		Eskimo Point health office
		Snowdrift nursing station
		Holman Island nursing station

(continued on next page)

Started	*Completed*	*Name*
1970/71	1971/72	Wrigley nursing station
		Gjoa Haven nursing station
		Tuktoyaktuk nursing station
		Sachs Harbour clinic and residence
		Inuvik health office
		Whitehorse paving project
		Mayo administrators' residence
1971/72	1972/73	Spence Bay nursing station
		Nahanni Butte health station
		Pelly Bay nursing station
		Fort Franklin transient trailer

New Projects, Pilot Projects, Studies, Etc.

Numerous special projects were studied. Those initiated include the "Reduction of Infant Mortality and Morbidity", "Environmental Health Services", "Mental Health Delivery System", "Dental Nurse Therapist Program".

A pilot study to develop a health data system was conducted in the Northwest Territories in the fall. The study is progressing through four phases:
- Fact finding
- Collection of data
- Processing of data
- Analysis and utilization of reports

A computerized public health nursing program monthly report has been initiated throughout the Yukon and the Northwest Territories.

A perinatal and infant mortality committee has been formed for the Northwest Territories to investigate factors associated with health and illness in infants. An infant health pilot project, employing one nurse and two Eskimo home health aides has been established at Eskimo Point to provide intensive follow-up of infants under one year of age.

A pilot project in para-medical training was initiated in Baffin Zone. The results of this project will be examined for application in other areas.

A program aimed at the prevention of tuberculosis by selective mass chemoprophylasis has been employed in certain parts of the north and late in 1971 a special controlled protocol was introduced at Frobisher Bay.

Personnel Problems

The high turnover of staff, including nurses, continued as a serious problem in the provision of health services. An extensive recruiting program was conducted for dentists, with some success, although the dental health needs still outstrip the supply of dentists practising in the north. Shortage of medical practitioners was less acute, with most positions for medical officers being filled. Attempts to recruit a psychologist and a psychiatrist for the Yellowknife area, in a move towards improving mental health in the Territories, met with failure.

Research

The Northern Medical Research Unit carried out the following activities during the year:

- Study of the influence of infant nutrition on middle-ear morbidity was concluded.
- Results of a study on the influence of protein meal on glucose tolerance in Eskimos were prepared for publication.
- A survey of parasitic infestations in patients from the north was carried out at Charles Camsell Hospital and at Snowdrift, NWT.
- Research was done into the effects of respiratory oxygen on amoebic infestations in rats.
- There was a survey of intestinal helminths in native-owned dogs on reserves in Saskatchewan, Alberta and the Northwest Territories.
- The study of isoniazid-metabolism in Eskimos and Indians was completed.
- Lectures and papers were given at several universities including McGill, Alberta and Manitoba and at nursing conferences and international meetings (2nd Circumpolar Meeting, Oulu, Finland; N.W. Pacific Meeting, American College).

Medical Problems

Since the incidence of tuberculosis in some Eskimo settlements remains high, priority has been given to continuous assessment of the problem. Specially developed surveillance procedures, including sputum surveys, for those with lung shadows have been intensified.

The incidence of gonorrhea continues to increase despite concentrated efforts to control it. On the other hand, the incidence of syphilis appears to be remaining lower than anticipated. A program of public education was intensified, routine control measures were carried out, periodic treatment programs for female repeaters was introduced in four communities and plans were formulated for a trial study of G.C. vaccine.

As regards the other infectious diseases, German Measles vaccine was included in standard immunization and improved reporting of notifiable diseases was introduced.

Plans for 1972

Projects for the fiscal year 1972-73 will include new construction, expansion and improvements to facilities in Fort Simpson, Edzo and Inuvik, in addition to projects commenced primarily for completion in 1972-73.

Plans are being developed for another extensive survey to up-date knowledge about the prevalence of tuberculosis. The results should make possible long-range planning for the control of tuberculosis to be adapted to the needs of each settlement. Existing preventive programs will be extended. Through a federal health grant the study of tuberculosis among Indians and Eskimos will continue throughout 1972. Efforts will be aimed at evaluation and refinements of an extensive domiciliary anti-tuberculosis program which was initiated five years ago.

A modified form of the Eskimo Point Infant Health Project will be established in one settlement along the Arctic coast of the Mackenzie area.

Home care programs being proposed for Whitehorse and Frobisher Bay will have an educational component intended to increase home competence in adult and child care.

An extensive program of clinical training of nurses for northern posts will operate in 1972 under the auspices of the Department of National Health and Welfare under agreements with several universities including McGill, Toronto, Sherbrooke, Western Ontario, Manitoba and Alberta. It is hoped that this training will lead to the recruitment of adequate numbers of Canadian nurses for service in the north and guarantee for the future a highly trained corps of nursing personnel for future paramedical duties in Canada.

It is anticipated that a two year training program for dental nurse therapists will be given in the Northwest Territories in September 1972 so that northern residents may be trained to work in the north.

DEPARTMENT OF NATIONAL REVENUE

CUSTOMS AND EXCISE

Responsibilities

To administer the customs and excise laws and regulations, particularly as they relate to the movement of aircraft and vessels.

Long-term Plans

To increase customs surveillance in the north as development makes it necessary.

Review of 1971 Operations

The local port of Whitehorse under the purview of the district port of Vancouver continues to administer customs regulations throughout the Yukon Territory. The Territory is served by all modern transportation engaged in import and export and the international movement of passengers. To accommodate this traffic, there are customs outports at Beaver Creek, Carcross, Dawson, Old Crow and Pleasant Camp. Customs duties at Old Crow are performed by the RCMP. Six locations are approved as customs airports of entry, and service is provided for highway sufference warehouses at Whitehorse and Dawson.

The Port of Edmonton provides service for aircraft at Yellowknife, NWT, on 72 hours notice and maintains an enforcement outport at Inuvik, NWT. Service at Yellowknife is performed by officers from Edmonton on an "On Call" basis. Service for Inuvik is provided by a local resident who is employed on a part-time basis.

The RCMP continue to provide service at Frobisher Bay, NWT, an outport under the jurisdiction of the port of Goose Bay, Newfoundland, which is administered by the district port of St. John's.

During the year, a new point of entry for aircraft at Cape Christian, Baffin Island, was authorized and customs service is provided by the RCMP. Also, the Atmospheric Environment Service of the Department of the Environment assumed responsibility for weather reporting stations formerly operated by the Meteorological Service of the Department of Transport. Customs formalities are now handled by employees of the Atmospheric Environment Service.

Customs service in the north, other than at the places described above, under the jurisdiction of the ports of Whitehorse, Edmonton, and Goose Bay, are tabulated below under the headings of the government department or service whose employees perform the duties.

Royal Canadian Mounted Police

Baker Lake	Pangnirtung
Cambridge Bay	Pond Inlet
Cape Christian	Resolute Bay
Coppermine	Sachs Harbour
Eskimo Point	Spence Bay
Lake Harbour	Tuktoyaktuk

Department of National Defence

Cape Dyer

Ministry of Transport

Coral Harbour

Department of the Environment

Alert	Isachsen
Eureka	Mould Bay

Plans for 1972

Normal planning to meet responsibilities.

TAXATION COMPONENT

For the convenience of taxpayers and the most economical operation of Canada's self-assessment income tax system, the taxation component has 28 district offices in Canada linked to the head office and data centre in Ottawa. The Yukon is served by the district office in Vancouver; the Northwest Territories by Edmonton; the eastern Arctic by Quebec. Labrador is part of the Territory served by the St. John's, Newfoundland district office. In addition to federal income tax, the department collects Canada Pension Plan contributions and premiums under the Unemployment Insurance Act.

DEPARTMENT OF PUBLIC WORKS

Responsibilities

The Department of Public Works, the principal construction arm of the federal government, undertakes a wide range of construction and maintenance work in the north, usually at the request of other government departments having responsibilities in the north. The department provides architectural, engineering and construction services, and assistance in planning, site investigation, economic feasibility studies, design, as well as construction and management of buildings, public utilities, highways, harbours and wharves.

It is responsible for the acquisition and disposal of lands and properties, for the leasing of office and other space when Crown-owned space is not available, and for the upkeep of a great number of federal buildings in the north.

Public Works has continuing responsibility for the development and maintenance of navigable waterways in the north. It is also responsible for the construction and upkeep of the northwest highway system, including the Alaska Highway and the Haines Road. (In April 1972 maintenance work on that portion of the Alaska Highway and Haines Road in the Yukon Territory will be undertaken by the Territorial government.) It provides an engineering service to the Department of Indian Affairs and Northern Development for the location, design and construction of roads under the northern roads program, which includes two major northern links – the Dempster and Mackenzie highways.

Accommodation, construction, marine, and highway operations in the north are the responsibility of the department's district directors working under the guidance of regional directors in the Pacific, Western and Quebec regions.

Public Works provides many jobs in the north; for instance, in any one day approximately 150 men were working on highway and other construction in the department's western region. In the Pacific region, in the Yukon, over 500 short-term employees were hired during the year, in addition to the 300 permanent DPW office and maintenance personnel.

Pacific Region (Yukon District)

1971 Accommodation Operations

The accommodation program for government departments in the north was such that the Yukon district of Public Works recorded the year as being one of its busiest in a long time. The department continued to let office, warehouse and housing to the Yukon Territory government as well as to Crown corporations.

The program for upgrading northern pool housing, for which the department is responsible, continued. Lighting in federal housing was improved; smaller projects such as interior renovation and exterior building maintenance were carried out.

At Faro accommodation was leased for a post office. RCMP detachment quarters, a cell block and permanent married quarters were built in this growing mining town of the north.

In Whitehorse the Takhini and Valleyview subdivisions were incorporated into the city. Public Works is still responsible for maintaining such municipal services as water, sewers, streets and the fire hall, until negotiations for turn-over to the city are completed. A contract for a new water supply, to be integrated with that of Whitehorse, will eliminate use of the outdated McIntyre Creek water system.

Accommodation Plans for 1972

The department will continue to operate and maintain general purpose federal government buildings, provide space for post offices, and administer and maintain northern pool housing. Building maintenance services for certain government departments and the RCMP will continue.

1971 Highway Operations

Routine maintenance of the Alaska Highway and the Haines Road was carried out by the department's own forces and by three commercial contracts in British Columbia. Bridge replacement continued with work being done on the approaches to the Nitsutlin Bay bridge and Sikanni Chief bridge. Work under the approved program for the reconstruction and paving of the Alaska Highway within settled areas was continued, with Miles 904 to 928 being completed.

The department provided engineering services for the Department of Indian Affairs and Northern Development northern roads program. Mile 123 to Mile 166 along the Dempster Highway and Mile 50 to Mile 93 (the B.C./Yukon border) on the Carcross-Skagway Road were cosntructed. The bridge across the Ogilvie River was successfully completed by the Department of National Defence under supervision of the Department of Public Works.

Highway Plans for 1972

The maintenance of the Alaska Highway and the Haines Road will be carried out by the Government of the Yukon Territory in its area under an agreement with the Department of Public Works, effective 1 April 1972. Public Works will continue to be directly responsible for maintaining the B.C. section and for new construction on the entire route.

The bridge improvement program on the Northwest Highway System will be continued, with the replacement of the Beatton River bridge at Mile 197 of the Alaska Highway and the Raspberry Creek bridge at Mile 324.

A project to reconstruct a 21-mile portion of the highway will begin. Six miles of the highway through Watson Lake, Yukon will be paved.

For the Department of Indian Affairs and Northern Development, Public Works will complete a site survey of the Dempster Highway, from Mile 166 to 291 (the Yukon/Northwest Territories border). An environmental study of the highway corridor from the Ogilvie River crossing to Fort McPherson is planned. A contract to construct an additional 12 miles from Mile 166 to 178 will be put out to tender and will likely proceed.

Western Region (Manitoba District)

1971 Accommodation Operations

Construction of schools, health stations, and other types of accommodation for departments was carried out in Manitoba, north of the 55th parallel.

An eight classroom school was constructed on the Indian reserve at Split Lake, for the Department of Indian Affairs and Northern Development. In addition, four housing units and one three-bedroom house were built for teachers on this reserve, some 70 miles northeast of Thompson.

At Pukatawagan a Department of National Health and Welfare health station was completed; as was a patrol cabin for the RCMP. Other patrol cabins were constructed at Brochet and South Indian Lake.

Public Works continued to operate facilities at Fort Churchill to provide support services to the National Research Council and the Churchill Research Range and to the Churchill Vocational Centre for the Northwest Territories government.

Accommodation Plans for 1972

A ten-room school with staff accommodation, and a nursing station for the Department of National Health and Welfare will be built at Nelson House.

Construction of a federal building is planned for Leaf Rapids. This is a new townsite in northern Manitoba which will be developed in conjunction with a new mining operation.

A residence for the postmaster at Gillam is being constructed under the federal Special Employment Plan and will be completed by May 1972.

Negotiations were completed with the Province of Manitoba for redevelopment of the townsite of Churchill which will permit the phasing out of the Fort Churchill activities. As the first step in development of the town, major water and sewer systems will be installed and approximately 30 housing units constructed.

Western Region (Edmonton District)

1971 Accommodation Operations

In Yellowknife, NWT an aircraft hangar with office and storage space, was constructed for the joint use of the Department of National Defence and the RCMP. Over 100 town-house family units were also built. Two major leases to accommodate the Mackenzie district headquarters of the Department of National Health and Welfare, and the relocated Oil and Gas Conservation Section of the Department of Indian Affairs and Northern Development were successfully negotiated.

To meet the continuing demand for housing in the north, 24 housing units and a 36-unit apartment complex were constructed at Inuvik. At Hay River 14 houses and a 14-unit apartment building were completed and taken over by the department. Four three-bedroom houses were built at Fort Simpson. At Upper Hay River a four-classroom school and staff housing were constructed for the Department of Indian Affairs and Northern Development. On behalf of the Department of National Defence an extension was made to the drill hall and garage at Inuvik.

New post office facilities were built at Fort Vermilion, Smith and Sexsmith, Alberta.

Work for the Department of National Health and Welfare included improvements to the nursing station at Tuktoyaktuk, NWT, completion of health facilities at Fort Chipewyan, Alta., and repairs to the nursing station at Fort McPherson.

A magnetic observatory and variometer building was built for the Department of Energy, Mines and Resources at Cambridge Bay, NWT. Designed and constructed by Public Works, western region, the structure is noteworthy in that only non-magnetic materials were used.

Accommodation Plans for 1972

Major federal government housing projects will be undertaken. It is anticipated that the departments of the Environment and National Defence will have a steadily increasing need for space in the coming year. A number of trailer-type living units for Environment staff together with service sites will be provided along the Mackenzie River at Arctic Red River, Fort Wrigley, Norman Wells and Fort Simpson.

A post office will be provided at Inuvik by renovating the federal building in that city. Another post office will be built at Cambridge Bay in the spring.

Additional office space will be provided in Yellowknife to accommodate the expansion of the departments of National Defence and Indian Affairs and Northern Development. A new hospital will be built at Fort Simpson.

1971 Highway Operations

Under the northern roads program for the Department of Indian Affairs and Northern Development, the initial construction of highways in the Mackenzie delta area was begun. Contracts totalling more than $7 million were awarded for the completion of a 33-mile section on the Mackenzie Highway, from Inuvik, towards Arctic Red River, and a 35-mile section of the Dempster Highway from Arctic Red River to Fort McPherson. Work started in mid-summer but was temporarily halted in December by extreme cold and the absence of daylight.

In order to preserve the natural continuous permafrost foundation on which these roads are built the movement of heavy equipment must be limited. This prevents damage to the natural organic insulation and protects the natural environment of the north. Helicopters are used to bring equipment and men into some regions and special methods and equipment must be used.

Engineering surveys, including road location and soil investigations, were carried out over the route from Inuvik, Arctic Red River, Fort McPherson to the Yukon boundary; and preliminary studies undertaken from Inuvik to Tuktoyaktuk.

In the southern part of the Northwest Territories the extension of the Mackenzie Highway to Fort Simpson was completed. Improvements were made to a section of the Liard Highway, and gravel surfacing from Mile 117 to Mile 232 on the Mackenzie Highway completed. Work progressed on the reconstruction of Miles 86 to 117 of the highway.

Plans for 1972 Highway Operations

Under the northern roads program in the western region construction will continue on

both the NWT section of the Dempster Highway, and the Mackenzie Highway. Miles 330 to 365 on the Dempster Highway will be nearing completion and 33 miles along the Mackenzie Highway from Mile 931 to Mile 964 are under construction.

A contract is expected to be awarded for work on the Mackenzie Highway from Mile 891 to Mile 931. Engineering surveys will be carried out along certain sections of both highways and on the Liard Highway from Fort Simpson to Fort Liard.

1971 Marine Operations

Improvements to the Athabaska-Mackenzie inland waterway dominated the scene in 1971. This north-flowing river system linking southern and Arctic Canada is unique. Its importance as a major Arctic transportation route has kept pace with the increasing level of exploration for minerals, gas and oil in the north, and it is earmarked for further improvements in the near future in response to increasing demands on its capacity.

Channel improvements in the area of Sans Sault Rapids were completed. The value of this work on the river was very evident in that no problems were encountered during the unusually late operations of transportation companies under conditions of very low water. Formerly this area presented a formidable bottleneck, seriously hampering operations on the river.

Extensive surveys on the Mackenzie River were started with the object of determining the dredging required to improve the river throughout its full length between Hay River and Tuktoyaktuk. These proposed improvements would involve a 25 per cent increase in draft, easing of some critical bends and better aids to navigation.

Wharf facilities throughout the Athabaska-Mackenzie system were maintained. A new floating wharf to serve the fishing industry was built on Lesser Slave Lake at Joussard, Alberta.

Maintenance dredging, snag removal and surveys were carried out by department vessels.

Herschel Island Study

The Herschel Island Study, a report which investigated the feasibility of constructing and operating a marine oil terminal in the Herschel Island area of the Beaufort Sea was published by the Department in November. Four sites, two east and two west of the Mackenzie River delta, are regarded as suitable for marine oil terminals. Two in the Herschel Island area are Herschel Basin, whose usefulness is limited by shallow water in the approaches, and Babbage Bight, some 20 miles to the south. The other sites discussed in the report are Horton River and Clapperton Island, both south of Amundsen Gulf.

The study was undertaken at the request of the Department of Indian Affairs and Northern Development and received the full co-operation of other government departments and agencies, as well as assistance of the oil industry.

Marine Plans for 1972

Surveys on the Mackenzie River will continue for the second year of a three year program. Data collected will be assessed and studies initiated to test the degradation effect of dredging on the river. Maintenance of the system will be continued.

Western Region (Northern Saskatchewan District)

1971 Accommodation Operations

Activities by the department north of the 55th parallel in Saskatchewan were limited to the construction of health stations for the Department of National Health and Welfare at Black Lake, Fond du Lac, Wollaston, Southend and Canoe Lake Indian reservations. Portable detachment quarters for the RCMP were constructed at Pelican Narrows.

Plans for 1972

A feasibility study for a proposed terminal at Reindeer Lake, Sask., will be undertaken.

Quebec Region

1971 Accommodation Operations

Residents of Fort Chimo, Quebec, were provided with regular mail and postal services after construction of a post office by the Department of Public Works in 1971.

A floating wharf providing approximately 70 feet of mooring space was constructed of steel units in Great Whale River. This structure, to be used for the loading and unloading of barges, will provide a means of transporting goods to and from the isolated community.

The 24-classroom academic and occupational school at Frobisher Bay on Baffin Island was completed for the Department of Indian Affairs and Northern Development.

Plans for 1972

A 17-classroom high school, to include a library and gymnasium, will be constructed for the Department of Indian Affairs and Northern Development at Great Whale River in northern Quebec.

Map shows places in the north where the Department of Public Works was active during 1971.

ELDORADO NUCLEAR LIMITED

Responsibilities

To operate a uranium mine in the Beaverlodge area of northern Saskatchewan and to engage in such exploration as the company may see fit.

Long-term Plans

To continue the above with due regard to uranium markets.

Review of 1971

Under the operating policy adopted in 1969, the production of uranium in 1971 was maintained at approximately 70 per cent of capacity. The number of employees at year-end stood at 388, of whom 269 lived in Uranium City.

Plans for 1972

Call for continuing operations at a reduced level.

GOVERNMENT OF THE NORTHWEST TERRITORIES

Responsibilities

To exercise government jurisdiction within the Northwest Territories, exclusive of control over natural resources (except game, which is a Territorial resource).

Long-term Plans

To develop the Northwest Territories through legislation and administration geared to the special social and economic needs of the area, and to involve all northern residents in the processes of government and economic and social development.

Review of 1971 Operations

After an extremely successful centennial year in 1970, the Government of the Northwest Territories concentrated its efforts in 1971 on developing and refining its programs and services for northern people.

Following its policy of moving government closer to the people, the Territorial government turned more responsibility over to local municipalities, hamlets and community councils. New hamlets were established in Frobisher Bay and Rae-Edzo, and courses were held in various other settlements to prepare the way for the creation of future hamlets.

One of the major events was the opening of a new school in Rae-Edzo, run by a school society elected by the people of the settlement. At another new school, in Frobisher Bay, education is now being offered for the first time in the eastern Arctic from kindergarten to senior matriculation. During 1971 a comprehensive north-oriented curriculum for the elementray grades was developed using material on the life of native residents of the Territories.

The structure of the Territorial public service was streamlined by combining four departments to create two service departments: the Department of Public Services, and the Department of Administration. An executive secretariat was organized to assist the executive in collecting, analysing and presenting information, and to assist in planning.

The Council of the Northwest Territories also created standing committees on legislation, allowances and indemnities, rules and procedure, and development and ecology. A committee on finance already existed. A special task force on housing was also appointed.

Review of Council Operations 1971

At a general election on 21 December 1970, 10 members were elected to represent the residents of the Northwest Territories. Two sessions of Council were convened during the year.

The budget of $92 million, introduced at the 44th session of Council in January, was the largest in the history of the Northwest Territories, and was, for the first time, prepared entirely by the Territorial government.

Council amended the Low-Cost Housing Ordinance to increase the amount that could be borrowed for house construction. The Federal Property Transfer Agreement Ordinance was enacted by Council to authorize the commissioner to work with the federal government in transferring the administration of buildings and facilities belonging to the federal government to the Territorial government.

General procedures for the publication and control of regulations issued by the commissioner under the ordinances of the Northwest Territories, and for their drafting, scrutiny and review, were provided by passage of the Regulations Ordinance. An amendment to the Companies Ordinance, concerning the rights of extra-Territorial trust companies and companies which move their headquarters into the Territories, was also passed by Council.

Council considered and accepted a proposal regarding the establishment of a Northwest Territories Water Board under the Northern Inland Waters Act of Canada.

The 45th session of Council was convened in Yellowknife on 14 June and prorogued on 25 June.

Legislation enacted by Council permits the taxation of buildings, fixtures and machinery used for mining, and authorizes the commissioner to borrow money from the Government of Canada and make loans to persons in the Northwest Territories during the fiscal year 1971-72.

A Securities Ordinance to control trading of stocks, bonds and other securities was also passed. The Dental Profession Ordinance was amended to establish the professions of dental nurse therapist and dental hygienist.

By an amendment to the Co-operative Associations Ordinance, co-operative associations were given the authority to form into federations. The Public Service Ordinance was amended to provide a clear code of conduct concerning the political activities of public servants.

The Age of Majority Ordinance reduces the age of majority to 19. The Dependants' Relief Ordinance permits a court to so modify a will as to make adequate provision for dependants; and the Infants' Ordinance provides a procedure for the management of property belonging to an infant.

The Public Service

The Government of the Northwest Territories functions with four program departments — education, industry and development, local government and social development, and four service departments — public

services, administration, public works and information. There is also a separate executive secretariat and a special unit for the clerk of the council. The headquarters administration is in Yellowknife, and there are regional offices at Fort Smith, Inuvik, Frobisher Bay and Churchill for the District of Keewatin.

It was announced that the regional office in Churchill will be phased out and that an area service office will be established at Rankin Inlet.

DEPARTMENT OF LOCAL GOVERNMENT

Responsibilities

To foster, encourage and assist in the development of local government; administration of the Municipal and Hamlet Ordinances; housing programs; town planning and lands; recreation; civil emergency planning; public library services and co-ordination of employment for northern residents.

Review of 1971 Operations

Development Division

During 1971, 12 new settlement councils were formed at Arctic Bay, Cambridge Bay, Cape Dorset, Chesterfield Inlet, Clyde River, Coppermine, Gjoa Haven, Grise Fiord, Lake Harbour, Pond Inlet, Snowdrift and Spence Bay. Also two new hamlets were incorporated at Frobisher Bay and Rae-Edzo.

Water and sanitation services, emergency airstrips, sidewalks, streetlights, freezers, bath houses and laundries were provided to settlements.

Municipal Division

Many capital projects were undertaken by local councils. Debenture loans totalling over $1 million were provided by the Territorial government to finance road construction, fire halls and equipment, extensions to water/sewer services and a veriety of municipal acquisitions. Operating grants to municipalities and grants for capital projects in excess of $1,500,000 were administered by the division. In co-operation with the NWT Association of Municipalities, a revision of the legislation governing municipalities was begun in 1971.

Housing Division

The housing division administers all housing programs in the Northwest Territories, except Territorial government staff housing and the National Housing Act Direct Lending Homeownership Program, which is administered by Central Mortgage and Housing Corporation in the municipalities of Yellowknife, Hay River, Fort Smith, and Inuvik.

The housing division administers, on behalf of the federal Department of Indian Affairs and Northern Development, the Northern Rental Housing Program, conceived in 1965 to provide adequate shelter for Eskimos and treaty Indians. With the provision of 115 new three-bedroom units during 1971, the total inventory has been increased to 2,200 units.

The Territorial Rental Housing Program operates on the same principle as the federal northern program, but low rental housing is provided to persons other than treaty Indians or Eskimos. During 1971, 51 additional units were erected, bringing the total inventory to over 150. In 1971/72 there was a joint project between the Department of Education, the Department of Personnel and the Housing Division to provide the same type of housing for teachers at the new hamlet of Edzo.

Construction on four senior citizen projects began, with occupancy scheduled for early spring of 1972. Ten units at Inuvik cost $170,000, eight units at Fort McPherson cost $144,000, eight at Fort Simpson were $136,000, and ten at Hay River were $150,000.

Town Planning and Lands Division

The town planning and lands division is responsible for overall town development and the location of all government projects in the Territories.

Administration and control of public lands in and around Frobisher Bay, Fort Providence, Aklavik, and Fort Simpson were transferred to the administration of the commissioner in 1971, making a total of eight municipalities and settlements that have been transferred. The administration has requested that 60 settlements and communities be transferred, and it is expected that the rate of planning will accelerate markedly.

Recreation Division

Financial assistance amounting to $79,877 was allocated to communities for the development of local recreation programs. The Territorial Experimental Ski Training Program continues to develop, and five portable pools were made available to the swimming program. New community centre facilities have been completed in Holman, Eskimo Point, Rankin Inlet, Pine Point, Inuvik and Snow-drift.

Renovations, expansions, or improvements have been made to facilities at Fort Smith, Yellowknife, Fort Simpson, Cambridge Bay, Pelly Bay, Hall Beach, Arctic Bay, Frobisher Bay, Coral Harbour, Norman Wells, Fort Norman, and Eskimo Point.

The Top of the World Ski Meet was again held at Inuvik in April. This meet is now recognized as an international cross country event, attracting top competitors from Europe and North America.

Civil Emergency Planning

Steady progress was made during 1971 in the drafting of municipal and settlement plans designed to enable the communities to react swiftly and efficiently in an emergency. Most principal settlements have plans completed, or in first or second draft.

Public Library Services

Local library service is now available to approximately 24,000 residents of the Northwest Territories, who borrowed 73,000 volumes in the fiscal year ending 31 March. Mail service to readers who do not have immediate access to a library is also growing. During the year, new libraries opened at Aklavik, Eskimo Point, and Norman Wells.

Employment Division

In November 1971 a small employment liaison division was created in the Department of Local Government to develop a scheme aimed at increasing employment of northern residents in both government and private enterprise.

DEPARTMENT OF EDUCATION

Responsibilities

Curriculum, school services, adult education, vocational programs.

Review of 1971 Operations

Developments in curriculum and in community participation in education were marked in 1971. The special school society elected by the people of Rae-Edzo began operation and management of their new school-hostel facility, opened in Edzo in the fall of 1971.

Enrolment

In September 1971, a total of 11,049 pupils were attending schools in the Northwest Territories. This is an increase of 7 per

cent from 10,334 in 1970. The average increase over the past five years has been 9.3 per cent of which more than 5 per cent can be attributed to more students staying in the system.

Adult Education

Many requests were received from people in the communities to establish classes for adults covering such subjects as English, the structure of government, taxation, home nursing, homemaking, budgeting, sewing, trapping, staking, hobbies, and academic subjects. Such classes were conducted at Chesterfield Inlet, Spence Bay, Holman Island, Fort Resolution, Fort Simpson, Coppermine, Yellowknife, Hay River, Gjoa Haven, Aklavik, Igloolik, Frobisher Bay, Fort Smith, and others. There are full-time adult education centres at Chesterfield Inlet, Eskimo Point, Igloolik, Pond Inlet, Frobisher Bay, Fort Smith, Coppermine and Fort Franklin.

Vocational Programs

The Adult-Vocational Training Centre at Fort Smith now offers full-time courses in ten major skills. Also, 217 people from the Territories were enrolled in vocational courses at 21 centres in seven provinces, where they received training in skills not yet available within the Territories.

Apprenticeship continues to be the most effective way to train trades-people. Manual skills are learned on the job; experience in all available trades being provided. In addition each indentured apprentice receives six to eight weeks a year of full-time trade theory in school.

Financial assistance is provided to supplement wages of persons who are receiving on-the-job training in particular skills. A total of 12 trainees came under this program during the period covered by this report.

Post-Secondary Education

A total of 151 students received financial assistance under the Northwest Territories Students Grant Program. It provides for financial assistance to all students who are admitted to a recognized university and whose parents are residents of the Northwest Territories. The program pays tuition fees, texts, transportation, and board and lodging. Another 10 independent students who are not eligible for grants received bursaries of $1,500 each for undergraduate or post-graduate training.

Curriculum

During 1971 a comprehensive curriculum was developed for elementary grades in the north. A curriculum handbook details the first seven years of a child's education: from kindergarten through grade six. To complement the handbook, learning materials that relate to northern culture and environment are planned. A three-part series of storybooks based on the heritage of the Dogrib people was researched, developed, and produced in the Rae-Yellowknife area. The completed series attempts to portray life among the Dogrib people about 100 years ago (the Johnny books); and the legends and stories of the Dogrib people.

During 1971 there was a considerable increase in the circulation of 16mm educational films, recorded tape programs and multi-media kits. New film titles were added to the library and equipment for high-speed duplication of audio tapes was installed.

School Construction

Two major school projects were opened in 1971. The Chief Jimmy Bruneau Elementary School and residence complex is the dominant public building in the new community of Edzo, combining a modern open area 15-classroom school with a 100-bed pupil residence, staff quarters and food services centre. At Frobisher Bay, the new Gordon Robertson Education Centre opened in September, providing 16 classrooms and 10 shops for academic high school and vocational students.

A five-room elementary school was constructed in Fort Good Hope, and a 10-room elementary school at Fort Resolution.

Construction progressed on a new 16-classroom high school in Hay River, an addition to the Samuel Hearne High School in Inuvik, and a new 14-classroom school in Rankin Inlet.

Teacher Training and Recruitment

Seventeen northern students enrolled 1 September in the teacher education program run by the department in Fort Smith. This is the third group of potential teachers for Territorial schools to enrol. The two-year intensive training course was developed in co-operation with the University of Alberta. During the first year of their training the students will complete academic and professional courses.

Also in September, 14 students of the 1970 teacher training class began the four-months' practice teaching portion of their program. Successful in the first year of studies at Fort Smith, and with summer school courses at the University of Alberta behind them, they will intern as teachers in southern Mackenzie District schools under the supervision and direction of selected, experienced teachers. In January the students will return to their studies of the professional aspects of teaching. In September 1972 the successful members of this group will be placed in schools throughout the Territories.

In 1971 there were 524 teachers employed by the government of the Northwest Territories and an additional 87 by the school boards of Rae-Edzo, St. Patrick's Separate School in Yellowknife, and the Yellowknife Public School, for a total teaching staff of 611.

DEPARTMENT OF SOCIAL DEVELOPMENT

Responsibilities

Social assistance, blindness and disability allowances, child welfare, medical-social services and rehabilitation, corrections, alcohol education, and health insurance services.

Review of 1971 Operations

Social Assistance

During the 45th Session, Territorial Council studied changes in the provisions of allowable income for social assistance recipients, and the increase in grocery allowance that became effective 1 May 1971. The changes were made as a result of increased costs. The increase in assistance varied considerably among different communities, averaging about 40 per cent. This marked the first change in the level of benefits since 1963.

Child Welfare

As of 31 March 1971, there were 291 children in the permanent care of the superintendent of child welfare. There were also 63 children in temporary care during the 1970-71 fiscal year, and 45 children adopted.

Medical, Social Services and Rehabilitation

At present an average of 34 northern residents requiring special care are accommodated in hospitals or other institutions in or outside the Territories. Often institutions in the provinces must be used, particularly for care of the mentally retarded.

Alcohol Education

The Territorial Alcohol Education Program received considerable attention from Territorial Council as a result of the increasing concern of some members about alcoholism in their constituencies. Additional funds will be allocated to help alleviate the

problem. During 1970-71 the Territorial Hospital Insurance Services modified its policy to include some costs of persons hospitalized for acute alcoholism. Also, the accreditation of some of the specialized treatment centres under the NWT Health Care Plan has meant that lack of funds no longer should deter persons from seeking treatment.

It is expected that the Alcohol Education Program will have a greater impact as a result of the unification of the department's field services. The program will now be represented in each community in which the department has field staff rather than the few it has been able to reach with its own limited staff.

Corrections Services

Corrections services in 1971 operated the Yellowknife Correctional Institution, a provincial institution for men and women, and the Correctional Camp on the Yellowknife River.

The report of the study committee on the corrections services (Jubinville Report) was tabled at the 45th Session. Its recommendations, along with those contained in a sessional paper on "Services to persons who have difficulty living within the law", were considered by Territorial Council. As a result, an increased emphasis will be placed on community-based services such as probation, parole and aftercare. A Corrections Ordinance, which will set out the philosophy and operating principles for correctional services for adults will be presented to Council. Among other things the ordinance will provide for the establishment of a NWT parole authority.

Health Insurance Services

Health insurance services are responsible for carrying out the requirements of the Territorial Hospital Insurance Service Ordinance as well as the Medical Care Ordinance, which was enacted in 1970 and implemented on 1 April 1971. Responsibility for these programs was given to the Department of Social Development in the general reorganization in October 1971.

Guidance and executive authority for the administration of the Territorial Hospital Insurance Services Ordinance is provided by the Territorial Hospital Insurance Services Board; medical advice for both ordinances is provided by a medical adviser who is employed by the administration to adjudicate disputes over length of stay in hospital and the propriety of charges for physician's services. The plan is temporarily handled from Edmonton, but the administration is scheduled to move to Yellowknife in 1972.

The medical care plan covers all medically necessary services rendered by a medical practitioner, and excludes such services as chiropractic, optometry, and most dental work. For the first five months of its operation approximately 15,000 persons received service and 40,000 claims were submitted to the plan. For statistical purposes this includes the claims received for visits from nursing stations in the Northwest Territories. At the end of August 1971, 37,500 individuals were registered with this plan.

DEPARTMENT OF INDUSTRY AND DEVELOPMENT

Responsibilities

Promoting and assisting industrial development, tourism, and game administration.

Review of 1971 Operations

Research and Planning

Planning for a Mackenzie Valley pipeline has been a major activity during the past year. Recommendations were prepared for using more local labour and materials in housing construction. The advantages of extending the airstrip at Coppermine from 3300 to 5500 feet were investigated, and it was concluded that the direct savings from using larger aircraft, and other benefits, would be sufficeint to warrant considering the extension. A consultant was provided to the people of Rae to study the feasibility of constructing a commercial complex at Edzo.

The first edition of a publication giving economic data on all communities in the Northwest Territories was produced.

Training

Elementary guide training courses have been conducted in Coppermine, Fort Franklin, Fort Simpson, Aklavik, Cape Dorset, Pond Inlet, Pangnirtung and Rankin Inlet. The initial six-week training course for junior office managers was successfully completed by seven candidates in January 1971. These have been posted to various projects for training on the job, where their progress is being monitored by area industrial development officers.

The second six-week formal course for candidates who completed their initial field training in Yellowknife in November. At its conclusion, the four candidates were posted to new locations under area game management officers to gain field experience.

Industrial Development Division

The NWT Small Business Loan Fund provided financial assistance to more than 32 small-business men with annual individual volume of less than $500,000. Loans in excess of $500,000 of the $600,000 currently available, have been authorized in amounts varying from $5,000 to the maximum allowable $50,000. Loans have been made to such businesses as tourism, air transport, cattle ranching, taxis, barber shops and dairying.

Interest in Territorial co-operatives continues to grow. Gross income during the year increased to $2,500,000 and well over 50 per cent of this amount was contributed to the local settlements. Total membership is now over 1,300 and these members own over 40 per cent of the assets of the co-operatives. During the past year, five new co-operatives were incorporated, including Lac La Martre Co-operative Limited, Chesterfield Inlet; Ikahuk Co-operative Ltd., Sachs Harbour; and Sanavik Co-operative Ltd., Baker Lake.

The industrial weaving project in Pangnirtung has expanded its product lines to include tapestry weaving. Designs drawn by local artists are being woven into tapestries. Karen Bulow Limited of Montreal, the company developing the project under contract, foresees excellent sales for this uniquely northern product in art galleries and exclusive gift shops in southern Canada, and eventually throughout the world.

Under a management contract, Ingo Schoppel Ltd. of Waterloo, Ontario has a successful knitting operation at Frobisher Bay. Employment has been provided for eight women knitting sweaters, mitts and scarves.

The fishing industry continued to be one of the major revenue-producing activities in the Northwest Territories. Major commercial fisheries were conducted on Great Slave Lake (3,500,000 lbs), Lac La Martre (197,000 lbs), and Cambridge Bay (135,000 lbs). In addition, commercial fishing was initiated on a trial basis at Pelly Bay and on Kaminak and Kaminuriak Lakes in the Keewatin Region. The total 1971 commercial fishery production was 3,791,171 lbs, at a landed value of $1,003,881.

Tourism Division

During 1971 significant developments in tourism within the Territories included an unprecedented number of commercial package tours. The luxury cruise ship *Norweta*, which brought group tours to the river settlements for the first time, was launched on the Mackenzie River and had a successful

first season. Compared with the tourist boom during the Centennial year 1970, road traffic fell markedly, but business at lodges and outfitters remained constant. Air travel, contrary to the national trend this year, show satisfying increase. The 17,500 visitors in 1971 spent an estimated $5,200,000, a slight increase over the $5,136,000 spent by 21,500 centennial year visitors.

Planning and construction of tourist facilities along the Northwest Territories highway system continued in 1971. By 1 August 1971 there were 12 designated campgrounds and 11 picnic areas in operation.

In 1971 a new tourism grant program was approved, with full implementation scheduled for 1972. Designed to assist the remote indigenous settlements to establish tourist accommodation, this program should provide economic benefits from the tourist industry to smaller remote native communities.

Game Management Division

The usual fluctuations were observed in 1970-71 fur production. Estimated figures showed a total production valued at $1,112,576, compared to the final figures of $1,058,134 the previous year. The average price per white fox pelt declined by $2 to $12.30, but the natural population cycle was on the upswing, and the catch increased from 6,700 to an estimated 25,500. The rapid spring break-up again cut down the beaver and muskrat harvest. Beaver was down by 1,200 pelts to an estimated 6,800, and the average price declined by $2.30 to $10.60. The 1970-71 muskrat harvest was an estimated 74,500 pelts valued at $96,000, compared to 114,000 pelts valued at $111,800 the previous year. The average price for mink dropped from $15 to $11.30, and interest in trapping mink therefore declined. The variation in production and value for other species was minor.

On Banks Island studies began in the fall of 1970 to determine the effects of a seismic exploration operations on white fox, caribou and muskoxen. Aerial surveys conducted over the entire island have resulted in estimates of caribou and revealed an unexpectedly large population of muskoxen. A quota of eight muskoxen was allotted to the Eskimos of Banks Island in 1970-71. Hunters from Sachs Harbour took two animals and realized a gross profit of $1,050 from the sale of hides. The people of Grise Fiord have taken nine muskoxen from their quota of 12, which resulted in a gross profit of $2,450 to the Eskimo hunters.

The quota and tag system has continued to be successful in maintaining the harvest of polar bear within safe limits. Of the 422 tags issued only 392 were used in the 1970-71 season. The taking of polar bear has now been restricted to the period from 1 October to 31 May. The polar bear sport hunting program, which functions within the Territorial quota, continued this year with six hunters accommodated at Sachs Harbour and four at Resolute Bay.

DEPARTMENT OF PUBLIC SERVICES

Responsibilities

Legal services, administration of ordinances, legislative counsel, administration of magistrates' and Territorial courts, administration and enforcement of safety regulations, labour standards, administration of the liquor control system.

Review of 1971 Operations

Legal Counsel

The legal counsel division is headed by a fully qualified barrister and solicitor who provides legal services to the Territorial executive and the several departments of the Territorial government. This includes the review of contracts, property transactions, actions in court on behalf of the Territorial government, and the administration of acts and ordinances.

Administration of Ordinances

At present 25 ordinances are being administered, including the Vehicles Ordinance, the Public Service Vehicles Ordinance, the several professional and business licence ordinances, and the Vital Statistics and related ordinances.

The sale of the popular Northwest Territories polar bear licence plates continued for the 1971 licence year. In the 1970-71 licence year a total of 8,474 vehicles was registered.

Project Surname was completed and disc numbers were not issued after 30 June 1971. The Eskimo people of the Northwest Territories will be known and identified by their chosen surnames, not by disc numbers as has been the case in past years.

Legislative Counsel

The legal advisor to the Territorial Council provides legal advice and services related to the preparation and passage of Territorial legislation to the Territorial council and its committees. He is responsible for the drafting, preparation, publishing and distribution of all Territorial legislation. In 1971, 37 ordinances were passed by the Territorial Council.

Magistrates' and Territorial Courts

On 1 January 1971 the Territorial government took over the administration of the Territorial and magistrates' courts from the Department of Justice, Ottawa. This branch will continue to grow as the population of the NWT increases and, new businesses and law firms open.

Administration and Enforcement of Safety Regulations

As part of the government reorganization in October, the fire marshal's office was added to the new department of public services and the administration and enforcement of all safety regulations was included under a single authority.

Inspections were given high priority in the fire prevention program for 1971. Total building inspections by inspectors and fire departments numbered over 2,000. All schools, hospitals and hotels and most of the tourist lodges were inspected. The greatest single hazard in 1970 was malfunctioning heating equipment, which caused 53 fires. One hundred and seventy-one fires were recorded in 1970.

An elevator inspector from the government of the Province of Alberta was contracted to conduct inspections of six passenger elevators and a dumbwaiter in Yellowknife, one passenger elevator in Fort Smith, one in Hay River, and four belt lifts and a freight elevator at the Cominco Pine Point operation.

In the area of industrial and construction safety, data compiled from workmen's compensation records indicate that the task of preventing industrial accidents within the NWT is urgent. Local safety associations are being formed and safety training courses, films and seminars are being conducted. Data relating to accidents and accident prevention are being distributed.

Labour Standards

The labour division, in its function of ensuring that workmen receive full benefits under the provisions of the Labour Standards Ordinance, processed 154 complaints covering vacations with pay, minimum wages, overtime, non-payment of wages, and other conditions. The labour division continues to work closely with departments of labour in southern Canada and with both Statistics Canada and the statistical and research section of the federal Department

of Labour in an effort to compile data about the Northwest Territories.

With the exception of a wildcat strike at Con Mine lasting for one shift, labour-management relations continued to be excellent in 1971. Conciliation services between companies and unions and the certification of unions are still handled by the federal Department of Labour.

Plans are being made to transfer the workmen's compensation office from Edmonton to Yellowknife early in 1972. Close liaison will be maintained with the Alberta Workmen's Compensation Board, particularly to take advantage of referee services.

Liquor Control System

The liquor control system operated through six government liquor stores, three liquor agencies and two beer agencies. Where conditions did not permit direct supply from Territorial liquor stores or agenices, supplies were imported from adjacent provincial liquor boards. Liquor sales increased 16 per cent in the fiscal year ending 31 March 1971, to about $5,590,000. Net revenue to the government was $2,400,000.

The appointment of the liquor control board was announced by the commissioner in his opening address at the 44th session of Council in January 1971. The board held 12 meeting, comprised of 25 sessions, from 1 January to 31 August 1971. Public hearings were held in Inuvik, Cambridge Bay and Fort Rae.

DEPARTMENT OF ADMINISTRATION

Responsibilities

Administration of financial operations, material management, data processing, general administrative services, personnel administration.

Review of 1971 Operations

Financial Operations

Revenue received by the government of the Northwest Territories for 1970-71 was $61,848,970; expenditures were $72,237,464.

Material Management

During 1971, final arrangements were made to complete the transfer of responsibilities from the federal government for the annual resupply of communities in the Baffin and Keewatin regions serviced by sea lift. A liaison officer has been temporarily stationed in Ottawa during the transition period. The transfer is to be completed with the 1971-72 shipping season. Material Management plays a key role in developing supply lines to northern communities by assisting in negotiation of transportation contracts and in bringing related parties together in the movement of material throughout the north.

Data Processing

The newly established data processing division continued to grow rapidly. Equipment was improved significantly, the staff was increased and data processing activities were expanded considerably. The major application introduced in 1971 was the new Medicare insurance program designed in the first three months of the year and implemented on April 1. Considerable work was completed in producing extensive and more useful financial management reports, and establishment control programs for the government staff.

Administrative Services

An administrative services division provides administrative support to all departments of government at headquarters in Yellowknife and provides assistance and guidance to administrative officers at the regional headquarters.

The central registry operation has been modernized by the purchase of a microfilming unit and two reader printers. The staff is microfilming all closed Territorial government files, after which all papers not of historical or legal importance and over two years old will be destroyed.

Personnel Administration

This division is responsible for the administrative aspects of personnel management. The division's activities are divided into two main areas: pay and benefit administration, and employee selection and placement.

There was a slightly higher turnover of Territorial government staff during the year. Approximately 300 competitions were conducted and over 9,000 applications received. Almost 1500 applicants were interviewed. Unsolicited applications in the form of letters, telephone calls and individuals visiting the personnel services office averaged 75 a week.

During 1971 more orderly procedures were introduced for the administration of some 1400 units of employee accommodation. Formal regulations governing the occupation and tenancy of their units have been drawn up and provided to employees. The former rent schedules have also been revised on a fairer basis.

DEPARTMENT OF PUBLIC WORKS

Responsibilities

All aspects of public works operations including design, construction and maintenance of roads, buildings and municipal services.

Review of 1971 Operations

Design Division

During 1971 visits were made to 30 settlements by staff and/or consultants. Wherever possible, settlement councillors were met and residents informed of and drawn into projects. Libraries of slides, reports, text books, trade literature and aerial photographs of settlements were built up and catalogued during the year and 10,000 drawings were microfilmed, registered and made available.

Research was initiated into the recycling of waste water, improved sewage disposal, pollution as well as prefabrication, use of foamed polyurethane structurally and as insulation, and structural use of fibreglass.

Construction Division

The construction division is involved in capital construction projects to a total of approximately $11 million. In 1971 the Territorial government assumed responsibility for the construction program in the Keewatin and Baffin regions, formerly administered by the Department of Indian Affairs and Northern Development. Major programs included: construction of 160 low-rental housing units; completion of the Jimmy Bruneau School and Hostel in Edzo; construction of the Hay River High School and the Frobisher Bay Elementary School.

Highway Division

The highway division had a permanent staff of 76 in 1971, supplemented by casual employees. It was responsible for maintenance of the Mackenzie highway system and connecting roads totalling approximately 1,000 miles, and for about 200 miles of winter trails. The division also administered a tote trail financial assistance program to assist entrepreneurs whose requests were reviewed by a committee.

The design and construction of roads was also undertaken for the federal Department of Indian Affairs and Northern Development and settlement streets and airstrips for the Department of Local Government.

The highway extension to Fort Simpson was completed in 1971 and a monument was unveiled by the Honourable Jean Chrétien, Minister of Indian Affairs and Northern

Development, to commemorate the completion of the road link at the Mackenzie River.

Ferry operations continued at the Mackenzie River crossing of the Yellowknife Highway and the Liard River crossing on the Mackenzie Highway. The *Johnny Berens* completed the season at the Mackenzie crossing for the last year, since it is destined for transfer to the Liard River crossing. The new larger ferry, soon to be christened the *Merv Hardie*, for the Mackenzie River crossing was completed in October and will be put in service in 1972.

Operations and Maintenance Division

The operations and maintenance division program involving buildings, plants, distribution and collection systems, and vehicles, is implemented by a staff of approximately 280 professional and technical personnel in the headquarters and four regional engineering offices. The total program increased from $11,051,500 during 1970-71 to $13,031,800 for 1971-72.

Operations of electric power generating plants and distribution systems in remote settlements is being transferred to the Northern Canada Power Commission, as this agency is able to assume more responsibility for supplying electric power in those settlements previously serviced only by government facilities.

DEPARTMENT OF INFORMATION

Responsibilities

To provide a centralized service in English, Eskimo and Indian languages to interpret the government's aims to the public; production of a variety of government publications; operation of the government's central printing unit.

Review of 1971 Operations

Public Relations Division

A most successful project of the public relations division has been the publication of an Eskimo newsletter, *Tukisiviksat*. The newsletter is written in both Eskimo syllabics and English, and a total of 3,200 copies is distributed throughout the eastern Arctic. *Tukisiviksat* has articles on government programs and activities and news of particular interest to the Eskimo people.

Work began in 1971 to organize an effective photographic service within the Department of Information. Photographs are now being more efficiently distributed to newspapers, magazines, almanacs and journals, as well as to the general public. Negatives are loaned and, in some cases, distribution of prints is free.

More emphasis is being placed on the quick distribution of news releases and Telex facilities are used more frequently. Over 150 news releases were distributed in 1971, with careful attention paid to their market, some going only to northern news media and others to all news media.

Publications Division

The publications division produced two hard-cover reference books in 1971: the commissioner's annual report and *Tiara and Atigi*, a book on the royal tour and centennial celebrations. Both publications were well received by the public. They were put on sale across Canada and, through special arrangement with Information Canada, both were sold in their bookstores.

Work continues on the updating of general information papers and pamphlets for answering public enquiries.

The Territorial government printing section has been reorganized to provide better work on a properly scheduled basis.

EXECUTIVE SECRETARIAT

Responsibilities

Financial co-ordination and program analysis, secretariat services, special projects, research and planning, evaluation and audit bureau, personnel policy and planning.

Review of 1971 Operations

In October the executive secretariat began functioning in the expanded role demanded of it by the general reorganization of the Territorial government structure. The entire financial and management services unit, the estimates and financial forecasting functions of the Territorial treasurer, and the policy-making functions of the former department of personnel, including establishment and classification control, negotiation of collective agreements, pay and benefits policy and manpower planning and development, were all added to the secretariat's responsibilities.

The responsibility for the employment of northern residents and liaison with Indian and Eskimo organizations was also added.

The executive secretariat is the Territorial government's liaison with various federal government boards, committees and commissions. It is also responsible for financial co-ordination and for planning and analyzing the Territorial government's long- and short-range programs.

Within the executive secretariat, the special projects unit continues to be responsible for matters of transportation and communication and various research and planning functions. The Northwest Territories Historical Advisory Board is also the responsibility of the executive secretariat. A special unit within the executive secretariat handles the secretarial functions for the executive committee and the various boards, committees and commissions appointed by the commissioner.

Evaluation and Audit Bureau

In 1971 the staff of this unit produced a system for departments to reclaim over $400,000 annually in sales taxes. Studies in one area alone may lead to the recovery of an additional million dollars annually from federal agencies.

Since 1970 the operational audit staff has taken on many new responsibilities. It has reviewed the accounting, financial and other related operations of the hamlets, liquor stores, public trustee, hospitals, fuel oil tax, workmen's compensation, pupil residences, industrial projects, weigh scale, correctional services and Territorial housing. The operational auditors verified all recoverable claims on behalf of the auditor for the Territories.

Personnel and Policy Planning

During 1971 procedures for the proper administration of the two collective agreements were consolidated. These cover teachers under the aegis of the Northwest Territories Teachers' Association (N.W.T.T.A.) and the remainder of the employees who are represented by the NWT Public Service Association (N.W.T.P.S.A.) except for those who are excluded because of managerial or confidential status. There are frequent informal meetings for consultation and discussion with the executive of these two organizations.

Collective bargaining with the NWT Public Service Association and the NWT Teachers' Association has indicated a need for a complete review of all benefit programs, and work has been initiated in this area.

During 1971 two new federal government programs were implemented — long-term disability and public service management insurance.

CLERK OF THE COUNCIL

Responsibilities

To supply support services to the Council of the Northwest Territories, secretariat services to the Territorial legislation policy committee and liaison with the chief electoral officer for Canada.

Review of 1971 Operations

Council was in session in February for 14 sitting days and again in June for a further 10. The support services provided to these sessions included the recording, editing, printing and distribution of the debates of Council in a form similar to Hansard, and the production and distribution of bills and sessional material.

At the June session a sound recording and reinforcement system, lent to the Territorial Council by the House of Commons in Ottawa, was used to record Council proceedings instead of the former method of employing a firm of court reporters.

GOVERNMENT OF THE YUKON TERRITORY

ADMINISTRATION OF THE YUKON TERRITORY

Responsibilities

To administer the Yukon Territory in accordance with the Yukon Act and other federal laws applicable thereto, and the ordinances of the Yukon Territory.

Review of 1971 Operations

During the 1971 first session of Territorial council, four bills were introduced and passed constituting and providing the legislative authority effective April 1, 1971, for the administration of courts having civil and criminal jurisdiction. The power to enact this legislation was given to the Commissioner-in-Council by virtue of amendments to the Yukon Act.

Negotiations continued for the Government of the Yukon Territory to assure maintenance of the Alaska Highway.

In late September, during a visit to the Yukon, the Honourable Jean Chrétien, Minister of Indian Affairs and Northern Development, announced a proposed new Yukon government building. This building will bring together all Territorial departments under a single roof. Completion date is set for 1975.

Plans for 1972

The takeover of responsibility for maintenance of the Alaska Highway by the Yukon Territorial government will be completed by April 1, 1972. Land appraisal and offers to owners, detailed soil survey and preliminary architectural plans for the new Yukon government building will be carried out.

COUNCIL OF THE YUKON TERRITORY

Responsibilities

To exercise powers comparable to those of a provincial legislature.

Review of 1971 Operations

An important historical event for the Speaker, members of Territorial Council, and the people of the Yukon was the presentation of a Speaker's chair and table during the third session of Territorial Council. Both furnishings, which now grace the Speaker's podium, were designed and hand-carved by a local industrial education teacher.

The Council was convened for three sessions in 1971. The first was from Feb. 8 to Feb. 26, and March 22 to Arpil 5. The second was held on May 26, and the third from Oct. 25 to Nov. 5. During the first session, Territorial Council passed seven motions, considered 15 sessional papers and 27 legislative returns, and passed 36 of the 37 bills tabled in the House. It was during this session that Council passed four bills constituting and providing for courts of civil and criminal jurisdiction. Other matters of importance to the Yukon were an Ordinance Respecting the Yukon Health Care Insurance Plan, the 1971-72 Budget, an Ordinance Respecting the Preservation of Archives of the Yukon Territory, an Ordinance Respecting the Expropriation of Land, an Ordinance to Amend the Elections Ordinance, an Ordinance for the Protection of Consumers, and an Ordinance Respecting Mentally Disordered Persons. Included in the motions was one appointing a special committee consisting of all members of Council to consider proposed changes to the Yukon Quartz Mining Act, the N.C.P.C. Act and Land Use Regulations.

The second session dealt with only one bill; an amendment to the Municipal Ordinance to provide for the extension of the boundaries of the City of Whitehorse. This session was called following favourable results of a plebiscite held on May 10 indicating a desire of the people resident in the metro area for the establishment of one local government for the entire area.

During the third session Territorial Council passed 14 motions, considered 10 sessional papers and seven legislative returns, and passed 13 of the 14 bills tabled in the House. The more noteworthy of the enactments passed were an Ordinance Respecting the Revised Ordinances of the Yukon Territory, 1971, an Ordinance to Change the Name of the Territorial Court of the Yukon Territory, an Ordinance Respecting Trades Schools Regulations, an Ordinance to Amend the Labour Standards Ordinance, and an Ordinance Respecting Employment Agencies.

Plans for 1972

To complete the furnishings of the council chambers, negotiations are progressing favourably to obtain a mace, symbolic of the authority of the Speaker. These negotiations should be completed early in 1972.

ADMINISTRATIVE AND LEGISLATIVE SUPPORT SERVICES

Personnel Adviser

Responsibilities

The personnel adviser is responsible for administering the Yukon Public Service Ordinance, the Yukon Public Service Staff Relations Ordinance and the Yukon Public Service Superannuation Ordinance.

Responsibilities of this service include the recruitment of civil servants and teachers,

job evaluation and pay administration, collective bargaining and employee relations, employee performance appraisal, staff establishment control and organizational analysis, and the administration of employee benefit programs and the keeping of personnel records.

Long-term Plans

Long-range plans for the personnel adviser include the development and coordination of employee appraisal systems, organizational analysis and staff establishment control and contact with departments in matters of contract interpretation and administration.

Review of 1971 Operations

Recruitment

During the year, 110 permanent and 149 casual for a total of 259 teacher appointments were made. Over the same period, 233 permanent and 702 casuals for a total of 935 appointments were made to the civil service. In total, 1,194 permanent and casual appointments were processed.

Classification and Pay Administration

Approximately 46 amendments were made to the classification and pay plan, 118 classification transactions were processed and 40 class specifications were prepared in final form and printed for distribution.

Training

Thirty-two employees attended management training courses within the Yukon, four attended "outside" training courses, while a further five employees updated their qualifications through correspondence courses.

Projects

The major responsibilities of the federal Department of Justice were transferred to the Yukon Territorial Government, and a major portion of the work touching on the Alaska Highway turnover was also conducted during the year. Managerial employees in the Territorial Government were offered participation in the federal government's Public Service Management Insurance Plan, while employees in the bargaining unit will be offered disability insurance, effective April, 1972.

Plans for 1972

The government will negotiate an agreement with the Yukon Teachers' Association covering approximately 250 teachers. In the latter part of 1972, management will be preparing for the forthcoming negotiations with the Public Service Alliance of Canada.

During the year emphasis will be placed on helping departments to interpret and apply the collective agreement, and greater emphasis will be placed on staff establishment control and organizational analysis. The trend of offering or sponsoring a greater number of training courses within the Yukon for employees, supervisor and managers will continue.

Clerk of Council

To provide legislative and administrative support services to the Council of the Yukon Territory and the executive committee.

Review of 1971 Operations

A major project during the latter half of 1971 for the Clerk of the Council was to consolidate and revise the ordinances of the Yukon Territory, last done in 1958. Secretarial services were provided by the Clerk of the Council to the executive committee and by the Assistant Clerk of the Council to the sub-committees of the executive committee. The Clerk of the Council also planned and organized official tours in the Territory. A full-time staff of three was engaged, in typing, transcribing and record-keeping.

Plans for 1972

The major project undertaken by the Clerk of the Council during 1971, the consolidation and revision of ordinances of the Yukon Territory, will be followed through to completion in early 1972. Planning and organizing of official tours in the Yukon and special assignments involving visiting dignitaries will continue.

Statistical and Planning Adviser

The statistics and planning office was created in 1970 within the Administrative and Legislative Support Services group. It is responsible primarily for the dissemination of accurate information on the Territorial economy. In addition, the statistics and planning unit, under the direction of the commissioner's office, researches various aspects of northern economic planning.

Long-term Plans

The statistical and planning unit was designed to provide statistical information to the various departments of the Territorial Government. Long-range plans include the development of a comprehensive statistical information bank, perhaps in conjunction with the Territorial government's proposed computerization program.

Review of 1971 Operations

An updated version of the Appendix of Statistical Tables which formed Volume II of the Carr Report was published as a statistical appendix to the commissioner's annual report for 1970-71. During the year, efforts were directed towards augmenting the statistical information bank.

Plans for 1972

Plans for 1972 include serial publication of statistical information for distribution to departments of the Territorial government. Continued improvement of statistical and research facilities is necessary as part of expanded administrative support services.

DEPARTMENT OF EDUCATION

Responsibilities

- To provide elementary and secondary education for the students of the Yukon Territory according to the provisions of the Yukon Schools Ordinance.
- To provide technical and vocational training to adults who desire to work in industries in the Yukon.
- To provide re-training and re-education for the present Yukon labour force.
- To provide support to local groups for recreation and sports programs.

Long-term Plans

Improvement and expansion of the present program and facilities, with particular emphasis on Indian education and special education.

Review of 1971 Operations

Elementary and Secondary Schools

In September 1971 the school population was 4800, an increase of 272 or six per cent over the previous year. The 22 schools under the jurisdiction of the Department of Education are staffed by 249 teachers. The largest school, the F.H. Collins Secondary School, enrols 983 students in grades 8 to 12. Senior secondary grades are also enrolled at Mayo, Dawson and Watson Lake. A number of other schools enrol grades up to 10. This is in accordance with the Yukon philosophy of providing secondary education as close to the homes of the students as possible. Where

a student is compelled to leave home, boarding assistance is provided.

The only additional facilities provided in 1971 were portable classrooms at the Kluane Lake and Watson Lake schools.

Both pre-school and post-secondary education are provided. A system of co-operative community kindergartens exists throughout the Territory; the department providing general supervision of them and paying grants for the instructors' salaries and general supplies. Since pupils who complete Grade 12 must go out of the Territory for post-secondary education, they are given financial help. By the end of February 127 students had received $103,850. In addition, 37 have been given Canada Student Loans.

Plans for 1972

It is hoped to start a second major building program this year which will eliminate the need for a number of portable classrooms now in use as well as adding accommodation for the growing number of pupils. Plans include the second phase of the school at Faro, enabling it to enrol grades 11 and 12. An addition to the Jack Hulland School will provide for the needs of the rapidly expanding community of Porter Creek. A junior-secondary school in Whitehorse will make it possible to relieve the pressure on the F.H. Collins School and eventually separate senior and junior secondary students. A further addition will be made to the Selkirk Street Elementary School.

Vocational Training

The Yukon vocational and technical training centre in Whitehorse, offers 15 pre-employment courses on a regular basis each year. Eleven of the courses are 10 months long, two are five months long (offered twice a year), one course is three months long (offered three times a year) and the academic upgrading course is on a continuous basis.

Four trades courses provide one-year credit towards apprenticeship; the welding course qualifies a person for a B.C. – D.P.W. No. 3 welding ticket; three courses are commercial; the nursing assistant's course provides a certificate recognized in other provinces. The remaining courses, such as cooking, drafting, heavy equipment operating and basic mining provide a certificate of training. The hairdressing course was dropped in June 1971. Arts and crafts was added as a regular course in October.

Basic prospecting courses were provided in the communities of Ross River (completed April 1971) and Upper Liard (completed February 1972).

In the term year of September 1970 to June 1971, 25 courses were given with a total enrolment of 430 students. In the term year of 1971-72, 307 students were enrolled in 17 courses up to the end of December 1971.

Three one-week management courses, conducted by B.C. Research Council and six one-week supervisory courses, conducted by Finning Tractor were provided under the administration of the Y.V.T.T.C. Three management courses and one supervisory course were provided in Whitehorse, four supervisory courses were provided in Clinton Creek and two in Faro. A total of 185 people were enrolled in the nine courses.

A total of 24 vocational-type courses were provided in Whitehorse with 299 people attending. Eighteen non-vocational courses were offered in Whitehorse, six outside Whitehorse with a total enrollment of 322 persons.

Under the Yukon Apprentice Training Ordinance, 15 apprentices in six trades areas were registered in 1971. Examinations were conducted for journeyman certificates and for a number of Red Seal Interprovincial Licenses for a total of 62 persons. Eight tradesmen were issued with Red Seal Interprovincial certification on Yukon journeyman certificates.

By the end of 1971 a total of 218 Yukon Journeyman Certificates had been issued in six trades; auto mechanics, heavy equipment mechanics, industrial electricity, hairdressing, plumbing and carpentry.

Plans for 1972

A new series of courses designed for individualized instruction in academic upgrading and skills from grades 1 – 4 and 5 – 10 will be provided in 1972. The grades 1 – 4 for illiterate persons will be offered in Whitehorse as well as communities outside Whitehorse.

Two additional trade courses, a small-business management course, home and child care courses, and short basic carpentry courses are contemplated for 1972. More are planned for the outlying communities such as basic prospecting, home and child care and basic carpentry.

Night and short-term courses for industry will continue to be offered to meet the requests and needs of the communities and industries.

Recreation Branch

The work of the branch falls into three main categories; financial assistance to local groups, leadership training, and support of special or Yukon-wide organizations or projects.

In 1971 local help was given to 17 community groups, including eight in the City of Whitehorse, and nine in smaller communities of the Territory. Continued efforts were made to standardize forms of support, and to encourage local initiative through cost-sharing.

In leadership training, clinics or courses were held in 20 different activities, as training for participants, coaches or officials. Many of these were aimed at participation by the Territory in regional or national sports competitions such as the Canada Games and the 1972 Arctic Winter Games, while others were in the field of general recreation. The latter included a major course for playground leaders, and training for participants in ballet, square dancing, band music, piano, and for scout and guide leaders.

Grants for special or Yukon-wide projects were allocated by the Advisory Committee on Recreation and Amateur Sport. These covered 14 groups or projects. The major activities involved participation by Yukon athletes in the second Canada Winter Games at Saskatoon, where they competed in twice the number of activities that they entered in 1967, and the annual Polar Inter-collegiate Games, a school project involving the visit of nearly one thousand student athletes to Whitehorse, about half coming from outside the Yukon.

The Territorial government's policy of supplying and staffing small above-ground swimming pools for outlying communities continued with the addition of three pools. The total number is now six. A building prefabricated by the vocational school was given to one community on a test basis.

Plans for 1972

Preparation for and participation by the Yukon in the 1972 Arctic Winter Games at Whitehorse will be an early priority. Expansion of summer programs in various communities and installation of one or more additional portable pools and buildings is also planned. Efforts to develop local programs will continue on as comprehensive a basis as possible. To this end the first Yukon recreation conference is planned for April.

DEPARTMENT OF HEALTH, WELFARE AND REHABILITATION

Health Services Branch

Responsibilities

The branch is charged with providing com plete health care to residents of the Territory. This is achieved by three separate plans designed to cover the whole spectrum of health services from preventative measures to hospital care for the acutely ill. The three plans and their areas of operation are as follows:

Yukon Health Plan

The plan is run in co-operation with the Department of National Health and Welfare and is directed at health education and the prevention of disease.

Yukon Hospital Insurance Plan

Hospital care for the acutely ill, whenever it is deemed to be medically necessary, is provided at no cost to residents at any approved hospital in Canada. Outside Canada the plan will pay a maximum of $40 a day (Canadian) for this service.

The plan also provides for the use of hospital facilities on an out-patient basis for the diagnosis and treatment of any injury, illness or disability together with any interpretations which may be necessary to achieve this.

Yukon Health Care Insurance Plan

More commonly known as *Medicare* this will be introduced on 1 April 1972 and will provide insured services which are medically necessary, without any geographic restrictions. As with the hospital insurance plan, payments outside of Canada will be limited to the amount paid for the service in the Yukon Territory.

Long-term Plans

- Continuing consultation for the takeover and operation of health care services being provided by the Department of National Health and Welfare.
- Development of the health care system to take advantage of technological advances as they become available.
- Updating and changing public health services in line with population increases and modern trends.

Review of 1971 Operations

Yukon Health Plan

An intensive care unit was opened in the Whitehorse General Hospital. Better use of Mayo General Hospital was effected by reducing the number of beds for the acutely sick and increasing community health-oriented facilities.

Yukon Hospital Insurance Services

The number of hospital beds in the Territory remained unchanged at 148. Hospitals are so located as to be reasonably accessible to the entire population of the Territory. The statistics show that there were almost as many in-patient treatments as in the previous year but that the use of out-patient services continued to grow.

- Registration of residents with the plan.
- Preparation of a publicity campaign using all available media and public meetings to inform the general public.

Plans for 1972

- The introduction of the Yukon Health Care Insurance Plan is a major undertaking and the main efforts of the branch will be directed towards ensuring that it is accomplished smoothly and efficiently. A continuous review of operational methods and requirements will be made so that adjustments can be made as quickly as possible.
- Separation of zone headquarters from the hospital and separation of the public health centre from the hospital.
- Introduction of a home-care service in Whitehorse.
- Implementation of public health service.
- Opening of a health centre in Carmacks.
- Providing a health station in Burwash Landing.

Services

In-Patients	1971	1970	Increase (Decrease)
Adult and Children			
Patient days	29,241	29,603	(362)
Separations	3,970	3,554	416
Average length of stay	7.4	7.7	(.3)
Newborn			
Patient days	3,143	2,990	153
Separations	524	494	30
Average length of stay	6.0	6.0	—
Out-Patients			
Diagnostic	5,384	5,108	276
Accident	2,086	1,998	88
Accident involving 3rd party	53	28	25
Total	7,523	7,134	389

Costs

In-Patient Services	$1,093,651	$1,143,280	$(49,529)
Out-Patient services	97,576	69,633	27,943
Administration	34,847	24,297	10,550
	$1,226,074	$1,237,210	$(11,136)
Per capita cost	$ 72.12	$ 75.80	$(3.68)

Social Welfare Branch

Responsibilities

The branch continues to be responsible for providing comprehensive public welfare in the Yukon Territory. The provision of financial assistance to persons of Indian status remains the responsibility of the Yukon regional office of the federal Indian-Eskimo Affairs Branch.

The Social Welfare Branch administers the following major programs:

- *General Assistance*
  - Social Assistance
  - Supplementary allowances
  - Care of the aged, including nursing homes and residential accommodation in senior citizen homes.
- *Categorical Assistance*
  - Blind persons allowance
  - Disabled persons allowance
- *Family and Child Welfare Services*
  - Family service
  - Protection of children
  - Child care
  - Foster home services
  - Adoption services
  - Unmarried parents services

Facilities established and administered by the branch include the following:

Whitehorse
- Two senior citizen homes —maximum capacity 60 persons
- Children's receiving home/assessment centre — capacity 15
- Home for handicapped children — capacity 7
- Family group home — capacity 8
- Group home for adolescent girls — capacity 8
- Group home for adolescent boys — capacity 8

Dawson City
- Nursing home/senior citizen home complex — capacity 25
- Children's receiving home — capacity 8

Mayo
- Children's receiving home — capacity 8

Watson Lake
- Children's receiving home — capacity 8

Legislative responsibilities include the Social Assistance Ordinance, the Child Welfare Ordinance, the Blind Persons Allowance Ordinance and the Disabled Persons Allowance Ordinance.

The headquarters of the Social Welfare Branch are in Whitehorse. There are two district welfare offices, in Dawson City and Watson Lake, from which services are extended to communities in the northern and southern areas of the Territory.

Total staff in 1971, including institutional staff, was 52.

Long-term Plans

In general, the Social Welfare Branch will continue to strive towards achieving a sound social policy that will demonstrate concern for the dignity of the individual and the preservation of family life. Ultimately, the focus must remain on prevention and rehabilitation as well as on new and innovative approaches towards the resolving of social problems.

The main objectives of the branch are to provide adequate and effective social services designed to resolve the complex social problems found in the Territory to alleviate poverty and hardship, to prevent conditions from worsening and generally to stimulate the development of a healthy social climate and aid in the social development of the people of the Yukon.

Review of 1971 Operations

The work and responsibilities of the Social Welfare Branch are constantly increasing. The economic and population growth in the past year has produced a greater need for social services, particularly in the field of family and child welfare.

For all programs the branch handled a total of 2,282 cases representing services to 4,640 persons. By comparison with 1970-71, this is an increase of 484 cases (27 per cent), and 1,151 persons.

Caseload figures by category of service are as follows:

Category of Service	Total Caseload Carried	Number of Persons Involved
Family and Child Welfare		
Children-in-care	509	509
Child protection	144	789
Foster homes approved	165	330
Adoption Services —		
— Agency placements	60	180
— Step-parent adoptions	7	21
— Adoption homes approved	37	74
Unmarried Parents	139	166
Family service	262	725
General Assistance		
Social assistance services	946	1,833
Categorical Assistance		
Blind persons allowance	6	6
Disabled persons allowance	7	7
	2,282	4,640

While there has been some increase in the number of social assistance cases, it may be attributed to the national decline of the economy with the concurrent family and social problems that normally ensue from unemployment. In the field of public assistance the branch has continued to direct its efforts towards rehabilitating and counselling families and individuals caught in the web of unemployment and poverty. Contrary to popular belief, there is a very small proportion of able-bodied men on social assistance. At December 31, fifty percent of the social assistance caseload comprised deserted wives, unmarried mothers and widows, all with dependent children; thirty percent were persons requiring assistance because of age, chronic or ill health; fifteen percent was made up of the chronically unemployed, and five percent of the caseload were transients.

There was a very significant increase in the work of the family and child welfare personnel, who are responsible for a broad range of specialized and supportive services. The caseload grew in all areas and the cost of providing services continued to increase in keeping with the greater demand, and the higher cost of maintaining children in care. There were 1,323 cases involving 2,794 persons. This reflects an increase of 329 cases and 700 persons over the previous year. Children-in-care, a major category of service, continued to be very active. Extreme poverty and squalid living conditions were two of the main reasons for severe neglect, family breakdown, desertion or extreme physical and emotional deprivation which made it necessary to take the children into custody. The total number of children-in-care during the year was 509 as compared to 426 in the previous year, an increase of 83. Days of care provided were 109,484 at an average daily cost of $3.76 a child.

Plans drawn up in 1970 for the establishment of much needed child-care facilities in outlying areas of the Yukon have been carried through successfully in 1971 with the completion of receiving homes in Mayo and Watson Lake. Both of these homes are of standard design with a finished basement. Each provides accommodation for the house parents and eight children. With the provision of more group homes for children, the branch is now able to place locally, children who might otherwise have had to be placed in special-care homes or treatment centres in the southern provinces. Treatment is being developed for the children who have experienced severe physical and emotional deprivation. In addition to highly qualified and skilled social work staff, qualified and experienced house parents staff these homes as in integral part of the "treatment plan" team. Two new establishments continue to meet a variety of needs for elderly Yukoners: Macaulay Lodge, which opened in February 1970, and McDonald Lodge (nursing home) which opened in December 1970. Completion of these new buildings brings to over one million dollars the amount expended in the past two years on establishments for the aged. The Yukon Territory now has modern facilities capable of providing nursing care and residential accommodation for a total of 90 persons, with provision to expand capacity to 110 persons.

Welfare expenditures increased by $217,132 over the previous year for a total of $1,175.456. Based on the total caseload for the year, of 2,282, the average cost of all services amounted to $515 a case. The per capita cost for the year was $65.30 based on a population of 18,000.

The cost-sharing agreement under the Canada Assistance Plan, which was signed in 1969 between the Yukon Territory and the federal Department of National Health and Welfare, reimburses the Territory 50 per cent of its expenditures for welfare services and assistance to those in need. The Canada Assistance Plan also shares in the costs of child welfare services, health services to those in need, and children in care of the Director of Child Welfare. In addition, it underwrites some of the operating costs of homes for children and facilities for the aged. Part of the cost of developing new services and improving and expanding programs is also paid.

Plans for 1972

Plans are under way to reactivate the Alcoholism Services program which was temporarily suspended in 1970. With the continuing growth in resource development and the consequent increase in population throughout the Territory, there has been a corresponding increase in alcoholism and its concomitant social problems. It is also planned to have the new Alcoholism Services Division tackle the growing problem of drug abuse in the Yukon. Measures of prevention, treatment and education will be used to combat both drug and alcohol addiction.

A study of all rates under the Social Assistance and Child Welfare program will be carried out with a view to providing for changes in living costs, consumption patterns and improvements in the general standard of living.

In view of the increase in admissions of pre-nursing care cases to the homes for senior citizens, a study will be made of the need to expand these facilities. Consideration may be given to the expansion of Macaulay Lodge (senior citizens home) which was especially designed for enlargement and to provide both residential accommodation and intermediate care for persons requiring minimal nursing-care and supervision.

During the 1972-73 fiscal year, the branch plans to increase its field services and area office personnel. It is extremely difficult to provide adequate and effective social welfare services to all of the small settlements and communities throughout the Territory because of distance, insufficient field staff and the large areas serviced by the two field offices.

The Social Welfare Branch will review policies and practices to determine where improvements and changes are needed so as to provide the people in the Yukon Territory with the kind of social services they need.

Corrections Branch

Responsibilities

The responsibilities of this branch fall into three main categories:

- To provide adult and juvenile probation services. In addition to these services to the courts, parolees and probationers from federal and provincial institutions and jursidictions are also supervised.
- To operate a juvenile training home for male and female juveniles declared by the courts to be delinquent.
- To operate a medium-security institution; which consists of arranging for the custody, care and treatment of persons who have appeared before the Territorial courts and have been remanded or sentenced to terms of imprisonment of less than two years.

Long-term Plans

Present growth trends in the Yukon indicate that planning along the following lines should be done:

- Greater use of probation services with more involvement by the community and the use of volunteer probation workers.
- Juvenile training home facilities and community resources will have to be extended to cater to the larger numbers of boys and

girls appearing before the juvenile courts. The impending change in the juvenile age will tax our resources still further.

- There should be little, if any, need for immediate additions to the medium-security institution being used. It is envisaged that the majority of inmates, who are not security risks, will be housed in minimum-security work camps on selected work projects; a more economical way of rehabilitating them.

Review of 1971 Operations

During 1971 a total of 416 admissions was recorded at Whitehorse Correctional Institution, broken down as follows:

Males:	271 sentenced
	119 remanded
Females:	17 sentenced
	9 remanded

The extended use of probation as a rehabilitative tool certainly affected the type of inmate being sentenced to imprisonment. The average length of sentence increased from 75.2 days in 1970 to 95.71 days in 1971 for males, and from 26.1 days in 1970 to 70.20 days in 1971 for females. It was found that those being incarcerated were the more sophisticated or hardened types of criminal; a trend it is expected will continue.

Obviously the probation work caseload increased, and rose from 152 on 31 December 1970 to 234 on 31 December 1971. The appointment of an additional probation officer during the year at least enabled us to keep abreast of the needs of the courts and provide a reasonable service to our clients.

During the year provision had to be made at the juvenile training home for girl juvenile delinquents and, in this area in particular, a growing problem became apparent. During the year, 47 juveniles were admitted to the juvenile training home (40 boys and 7 girls). In the same period 25 were released for various reasons leaving the population at 22 (16 boys and 6 girls) on 31 December 1971.

Plans for 1972

Inmate work crews will continue to be used on selected community projects, and extension of the vocational training centre facilities for admitting inmates to vocational training courses will be furthered. Plans are under way to provide a new permanent juvenile training centre to look after the diverse groups of young people coming to our attention.

DEPARTMENT OF HIGHWAYS AND PUBLIC WORKS

Responsibilities

To design, construct, improve and maintain all Territorial buildings, roads, and other public works using own work force or under contract. To provide engineering services and advice to all Territorial departments and to keep in touch with the appropriate branches of Indian Affairs and Northern Development regarding federally-financed projects carried out by this department under the Federal-Territorial Engineering Services Agreement and the Remote Airports Program.

Long-term Plans

Continuation of plans to bring roads up to improved standards. To prepare for and undertake surface stabilization on trunk highways. To improve design and construction standards for building projects carried out on behalf of other Territorial government departments and for use of own forces.

Review of 1971 Operations

The Yukon road network, with the exception of the Alaska Highway and the Haines Road, was maintained at a cost of approximately $2,561,364. The mileage maintained was 1,750 (1,121.4 miles both summer and winter, and 628.6 miles in summer only). A 55-ton ferry was operated on the Yukon River at Dawson City and a 36-ton cable ferry was operated on the Pelly River at the settlement of Ross River. A skyline was operated and an ice bridge constructed to cross the Yukon River at Dawson City during fall freeze-up and spring break-up to ensure an uninterrupted flow of mine products from Clinton Creek, west of Dawson City, to outside markets. The Ministry of Transport airports at Dawson City and Mayo as well as a number of Territorial flight strips were maintained.

Road reconstruction was undertaken on the Whitehorse-Keno road at Mile 117 and Miles 146.2 to 168.5. The Stewart Crossing-Dawson Road was reconstructed at these mileages: 76.3 to 81.67, 83 to 99, 105 to 107.6, and 110.1 to 111.4. The following roads received some improvement during 1971: Fish Lake, Miles Canyon, Atlin (Miles 3 to 6) and Tagish (Miles 1 to 11). Shoulders were widened on the South Access Road. Culverts were installed on the Campbell Highway and Nahanni Range Road. The Hospital By-Pass Road in the City of Whitehorse was constructed and paved. A dust control program was carried on throughout the Territory: calcium chloride being applied on part of the Whitehorse-Keno road and Campbell Highway; the balance of the work being done with PS300 fuel oil.

The Old Crow Airport was completed during 1971, and a new airport constructed at Carmacks.

Landscaping, fencing, and other ground improvements of Yukon Territorial Government properties continued.

Building construction included a grader station and trailer complex at Ogilvie River on the Dempster Highway; storage buildings at the Drury Creek, Twin Creeks, and Boundary Road grader stations; forest service residence at Faro; three receiving homes in Whitehorse, and one each in Watson Lake and Mayo; a garage at Dawson City for the welfare office; and the beginning of the library expansion and archives addition. Additions were also made to various schools – Jack Hulland, Selkirk Street, Van Gorder, and the cafeteria at F.H. Collins – and also to the tourist information centres at Haines Junction, Beaver Creek, and Dawson City.

Portable residences were set up at Ross River, Drury Creek, and Tuchitua. Numerous renovation projects were carried out, such as the basements of Kluane Lake and Beaver Creek schools, Selwyn staff house, and the liquor store at Dawson City.

Two hundred and fifty-one Territorially owned buildings were maintained.

Plans for 1972

Upgrading will continue on the Campbell Highway from Mile 258 to 318, the Klondike Highway from Mile 168 to 191, and Tagish and Atlin roads.

Two Mile Hill will be improved and an asphalt overlay applied.

Miles 0 to 10 of the Whitehorse-Keno road will be paved.

Construction of the Industrial Road in the City of Whitehorse will be completed and the road paved.

Responsibility for maintenance of the Alaska Highway system in the Yukon Territory and the Haines Road to the Alaska border will be transferred from the federal Department of Public Works to the Yukon Territorial Government on 1 Arpil 1972.

The building construction program proposed and listed by other departments will be carried out.

DEPARTMENT OF LEGAL AFFAIRS

Responsibilities

The department is responsible for the administration of justice in the Territorial court system which includes the Yukon Court of Appeal, Territorial Court, Magistrate's Court and the Justice of the Peace courts. The Yukon Court of Appeal normally sits in Vancouver. The Territorial Court and Magistrate's Court are established in Whitehorse but travel on circuit when necessary. Justices of the Peace are appointed and sit in all communities in the Territory. Small debt officials with jursidiction up to $500 sit in Whitehorse, Watson Lake and Dawson City. The magistrate and some of the justices of the peace hold appointments as juvenile court judges and deal with juvenile offenders pursuant to the Juvenile Delinquents Act of Canada.

The department provides legal advice and services to the Commissioner, the Territorial Council and all departments of the government. All legal documents and ordinances and regulations are drafted in the department or are prepared under its supervision.

Review of 1971 Operations

The department was created on 1 April 1971 to take over the responsibilities formerly discharged by the legal adviser on the one hand and the federal Department of Justice in the Territory in relation to Territorial matters on the other hand. The responsibilities of the federal department were assigned to the Territorial Government, except for the prosecution of criminal code and federal offences and the appointment of BNA Act judges. The federal Department of Juctice maintains a Crown prosecutor in the Territory. The administration of justice in the Territory was entirely reorganized during the year in order to ensure closer financial reporting and statistical control.

The coming into force of the Bail Reform Act imposed a burden on the department requiring preparation, printing and circulation of a variety of forms, and the educating of judicial and court officers in the new procedures. A magistrate and justice of the peace conference was held in Whitehorse and the new Act was a central theme.

Plans for 1972

It is expected that, when the police contract is signed in 1972, the department will be in closer touch with police services through administration of the police agreement.

DEPARTMENT OF LIQUOR CONTROL

Responsibilities

The liquor control department regulates the importing, retailing and distribution of all alcoholic beverages within the jurisdiction of the Liquor Ordinance and regulations pertaining thereto.

Long-term Plans

- To control the number of licenced outlets so that the quality of lodging and food establishments in the Territory can be improved both for the travelling public and the Territorial residents.
- To improve sales and reduce operating costs so that more money will accrue to the government.

Review of 1971 Operations

A new self-serve liquor store was opened in Faro on 26 October 1971. Situated in a new shopping centre in the town site, it will serve the ever-increasing population in the Anvil Mines area. The Dawson City liquor store was converted to a self-serve operation in December 1971. The warehouse facilities have also been modernized.

Haines Junction liquor store also changed over to self-serve during 1971. This store will provide modern service for many tourists as well as residents, as Haines Junction is situated at the junction of the Alaska Highway and the Haines Road.

All liquor stores in the Yukon Territory are now self-serve, and our modern warehouse with fork lift trucks is able to handle all beer and liquor shipments on pallets and with greater speed.

All shipments from the United Kingdom are containerized which ensures faster service and reduced freight costs. Similar arrangements have been made for shipments from France, Germany, Denmark and Holland.

Plans for 1972

It is hoped that further steps can be taken to improve licenced premises and enforce the Liquor Ordinance by means of frequent detailed inspections. Preparations are being made for data processing for inventory control.

DEPARTMENT OF LOCAL GOVERNMENT

Local Government Branch

Responsibilities

- To provide municipal services for all unorganized communities in the Territory.
- To help unorganized communities become functioning municipalities as soon as economically possible.
- To maintain an advisory service and inspect municipalities for compliance with the provisions of the Municipal Ordinance.
- To continue to develop policies that will permit municipalities of various sizes to provide the best possible service to their taxpayers.

Long-term Plans

- To provide and continually update municipal procedure manuals for the guidance of officers in smaller municipalities.

Review of 1971 Operations

Municipal Services Branch

This branch is responsible for administering the Territorial low-cost housing program. During the year there were:

	1st Mortgages	2nd Mortgages
Applications received	15	4
Applications cancelled	1	0
Applications refused	0	0
Applications approved	38	4

All municipal legislation was replaced by drafting new legislation for consideration by the council in 1972. A new system for collecting tax arrears has been adopted.

Plans for 1972

- To incorporate further guidelines that will bring about closer liaison between the Municipal Services Branch and the local improvement district bodies.
- To review the various services and the levels at which they are being provided in the communities in order to ensure that funds are being properly allocated.
- To review community status of local improvement districts.
- To review pipeline development.
- To introduce more advanced accounting procedures to communities.
- To establish a Territorial lands planning section that will provide guidelines for the orderly development of municipalities and organized communities and make lands available for sale.

Accommodation Services Branch

Responsibilities

To provide adequate accommodation for Territorial Government employees under the present staff housing policy and to manage the office accommodation for the Territorial public service.

Long-term Plans

Due to increasing responsibilities being assumed by the Territorial Government, further expansion of staff is expected; as well as an increase in the space necessary to accommodate these people.

As of 1 April 1972, the Alaska Highway maintenance staff is being transferred to the Territorial government. Approximately 50 housing units in various camps will be transferred to our control as well as an additional accommodations officer. A survey of the units turned over will be carried out during 1972-73 to plan for their replacement some time in the future.

Proposals will be requested from private developers to provide the Yukon Territorial Government with leased apartment units in several Yukon communities. It is proposed that these will be on a long-term lease. Any temporary trailer accommodation at the communities where permanent quarters are obtained will be used temporarily in small communities until such time as more lasting accommodation can be developed.

Review of 1971 Operations

The anticipated Alaska Highway takeover did not take place. New housing was not developed, except at some Territorial grading stations, and several temporary trailers were leased for Faro.

Development of permanent accommodation for teachers outside Whitehorse was delayed pending decisions on school construction.

Plans for 1972

- Additions to John Korbo Apartments — Dawson City.
- New dwelling — Haines Junction.
- Lease contract developments at Faro and Watson Lake.

Housing Development Branch

Responsibilities

The forerunner of the Yukon Housing Corporation is being set up to develop housing under Sections 15 NHA (Limited Dividend) called Yukon Rental-Purchase Housing, and Sections 40 and 43 NHA — Subsidized Rental Housing. These units will be developed and managed by the housing corporation. This accommodation will be available to persons earning less than $8,000 a year.

Review of 1971 Operations

Under Section 40 NHA call for tender to build 43 housing units at Whitehorse, YT went out. This is the Yukon's first subsidized rental housing project.

Plans for 1972

- Two project officers hired to develop programs.
- A branch head (to become manager of housing corporation) to be obtained to develop long-range program.
- Forty units of Section 15 housing will be developed in communities outside Whitehorse.
- Forty units of Section 43 housing, subsidized rental, will be developed in small communities outside Whitehorse.
- Needs survey will be carried out on Yukon communities and complete five-year development forecast confirmed.
- Housing corporation to be established according to new legislation.

Lands and Assessment Branch

Responsibilities

- The assessment of all property liable to taxation by the Territorial Government.
- The sale or lease of lands under the administration, management and control of the Commissioner.

Long-term Plans — Assessment

With the federal and Territorial governments now subject to a grant in lieu of taxes on their respective properties, it is the intention of this branch to analyse this area of assessment more closely in 1972.

Review of 1971 Operations

A general assessment of Dawson City was carried out.

The expansion of Whitehorse City boundaries meant a major revision of the assessment roll. The change-over was accomplished without serious problems. Assessment figure for the whole Territory, including the municipalities, amounts to almost 100 million dollars.

Plans for 1972

- An annual assessment will be carried out throughout the Territory in 1972.
- All assessment work in the Yukon becomes our responsibility under new municipal legislation.

Long-term Plans — Lands

- To establish a land disposal policy which will clearly define permitted uses of all available areas in the Yukon.

Review of 1971 Operations

Monies received from all land transactions in 1971 amounted to $347,493.89. Some 140 notifications for title were issued by the Commissioner of which 26 were for Riverdale and 50 were for Porter Creek.

Plans for 1972

Additional lots are to be offered for sale in Riverdale and indications are that it will be a busy building year. Land has been

acquired for low-cost housing within the City of Whitehorse. Land assembly is being prepared for rental-purchase units in areas outside Whitehorse.

Protective Services Branch

Responsibilities

- To implement and administer an effective fire prevention program for the reduction of life and property loss from uncontrolled fire.
- To review building plans and specifications for conformity with Territorial and national building and electrical standards.
- To maintain ongoing programs for the improvement of fire prevention, building, and electrical standards within buildings.
- To disseminate information to the general public and industry for the reduction of fires in the home and place of employment.

Review of 1971 Operations

In-service training of all volunteer and industrial fire departments is now conducted on a monthly basis by the office of the fire marshal.

Pending receipt of the final figures, fire losses in 1971 amounted to approximately $659,000. The increase over 1970 was approximately $25,000.

There were two lives lost due to fire.

The two fires which caused the largest loss – approximately $217,000 – occurred in areas without municipal fire protection.

Faro Village volunteer fire department was awarded first place in Canada in 1971 in the National Fire Prevention Competition, Division F; municipalities with a population of 2,500 and under. The award is in recognition for all-round efficiency in fire prevention.

Plans for 1972

- Increased emphasis will be placed on providing the native communities with adequate fire fighting facilities in the form of fire sirens, portable pumps and extinguishers.
- The ambulance service, a responsibility of the federal Department of Public Works, will become under the aegis of the department, effective 1 April 1972.
- Regulations are being drafted for the adoption of the 1970 National Building Code of Canada throughout the Territory.

DEPARTMENT OF TERRITORIAL SECRETARY AND REGISTRAR GENERAL

The department is responsible for the following:

- Registration Services:
  - Companies
  - Securities
  - Societies
  - Vital statistics
  - Business licences
  - Co-operative associations
  - Credit unions
  - Partnerships
  - Document registrations
  - Insurance
- Inspection Services
  - Labour standards
  - Liquor
  - Public health
  - Steam boiler
  - Watson Lake checkstation and Whitehorse weighscales
- Motor Vehicles:
  - Transport – Public utilities
  - Driving program
- Workmen's compensation
- Public administrator
- Records office
- Queen's Printer

The primary operations are at headquarters in Whitehorse, with agents at Watson Lake, Haines Junction, Mayo, Dawson, Faro, and checkpoint and weighscale operators at Watson Lake and Mile 918 on the Alaska Highway.

Long-term Plans

The long-term plans of the department are to set up a weighscale in Carcross upon completion of the Skagway Road and to establish Territorial agents separate from the liquor vendors at various communities.

Review of 1971 Operations

Registration Services

- Under the Business Licence Ordinance 522 licences were issued of which 403 varying classes were resident, 29 were non-resident and 90 were classed as Tourist Establishments.
- Under the Insurance Ordinance 27 salesmen and four officials were licenced.
- Under the Securities Ordinance nine salesmen and two brokers were licenced. Nineteen prospectuses were filed and seven amendments to prospectuses were received and registered.
- Under the Societies Ordinance 15 new societies were incorporated, two were reinstated, three filed revised by-laws and 42 filed financial statements.
- Under the Companies Ordinance, 70 companies became new Yukon incorporations, and 112 companies were licenced extra-Territorially, for a total of 182 new companies.
- Under the Vital Statistics Ordinance, 440 certificates of registration of birth, 108 certificates of registration of death, and 162 marriages were recorded by the registrar. Also indexed with Dominion Bureau of Statistics were 38 adoptions, 11 name changes and 18 delayed registrations of birth.
- Under the Bills of Sale Ordinance, Conditional Sales Ordinance, Assignment of Book Debts, and the Garagemen's Lien Ordinance, 2,945 documents were registered.
- Under the Partnership Ordinance, 11 partnerships were filed.
- Recorded in the professional register were licenses issued to 1 chiropractor, 4 dentists, 3 dental hygienists, 18 doctors, 42 lawyers, 3 optometrists and 6 pharmacists.

Inspection Services

Under the Labour Standards Ordinance 398 wage claims were investigated and $55,039.03 in unpaid wages was collected on behalf of employees. Two hundred and twenty-five labour inspections were made.

Under the Liquor Ordinance 389 separate inspections of licenced premises were made.

There were 33 inspections under the Workmen's Compensation Ordinance and Accident Prevention Regulations.

There were 41 investigations under the Motor Vehicles Ordinance, 22 under the Companies Ordinance and three under the Business Licence Ordinance.

Under the Fuel Oil Tax Ordinance, nine inspections and six invesitgations resulted in the collection of $16,916.70 in unpaid taxes. The inspection staff made 34 road trips which accounted for a total of 19,135 miles and 118 days away from the office.

A total of 197 prosecutions were entered as follows:

84 Labour Standards Ordinance
11 Liquor Ordinance
26 Workmen's Compensation Ordinance
45 Motor Vehicle Ordinance
27 Fuel Oil Tax Ordinance
2 Companies Ordinance
2 Business Licence Ordinance

The Watson Lake Checkpoint operates on a continuous 24 hour basis. Three operators, in addition to one supervisor and one casual employee, check all trucks, issue permits and assess and collect fuel tax. A total of 14,873 vehicles was checked and recorded, $93,400 was collected from the issue of freighter permits and $38,174.02 in fuel tax for a total revenue of $131,674.02.

The Whitehorse weigh scale keeps the same hours and with the same number of employees as the checkpoint. The scale came into operation in June 1971, and for the six month period 21,600 trucks were weighed. A total of $24,730.54 was collected by the issue of overweight and freight permits and $1,363.62 in fuel tax, to a total revenue for six months of $26,094.16. The grand total for the year from the check point and the scale is $157,668.18.

Under the Steam Boilers Ordinance, 132 inspections were conducted in the Municipality of Whitehorse. Ninety-eight steam engineers are licensed under this Ordinance.

Motor Vehicles

Under the Motor Vehicles Ordinance, 25,146 licences, certificates and registrations were issued.

Workmen's Compensation

Under the Workmen's Compensation Ordinance, there were 1,530 accidents reported during 1971, an increase of one over 1970.

Public Administrator

The Public Administrator commenced the year with 77 current files. An additional 67 files were opened consisting of 56 for estates of deceased persons, 6 for mentally incompetent patients, 1 for a minor and 4 for missing persons. During the year files were closed on 44 estates of deceased persons, 5 patients, 1 minor and 4 missing persons, leaving 90 files current as of 31 December 1971.

Records Office

The following figures show the volume of services provided by the Records Office and its two sub-stations:

New files opened	507
Files routed to departments	46,050
Mail incoming and outgoing	379,762
Records destroyed	64 cu. ft.

Plans for 1972

Plans for 1972 include an inventory of all Yukon Government files, the establishment of a records centre, and the preparation of a records and disposal schedule for the purpose of disposing of obsolete records and to identify and preserve important records.

Queen's Printer

The Territorial Secretary, as Queen's Printer, makes available various printing equipment to handle the printing done by the government. Also, the Queen's Printer is responsible for the printing of all ordinances, amendments to the ordinances of the Yukon Territory, the printing of regulations, votes and proceedings of the council sessions and is responsible for approving all publications of Gazette Notices as required by certain ordinances of the Yukon.

DEPARTMENT OF TOURISM, CONSERVATION AND INFORMATION SERVICES

Game Branch

Responsibilities

The branch is responsible for administering and enforcing the Game Ordinance, Brands Ordinance, Pounds Ordinance, Fur Export Tax Ordinance and the federal Migratory Birds Convention Act as well as conducting programs that are necessary for proper wildlife resource management.

Long-term Plans

- To expand areas of enforcement and administration to a point where all travelled and settled portions of the Territory are provided with adequate wildlife protection and conservation services for all forms of wildlife and freshwater fish.
- To collect data and inaugurate scientific and related studies to be carried out by a staff biologist and to assist other bodies engaged in biological work in the Territory.
- To co-ordinate the activities of trappers, guides, outfitters, hunters and sport fishing guides to ensure the most efficient and satisfactory use of the renewable wildlife resources.

Review of 1971 Operations

An additional game warden was taken on staff in the fall of 1971, and will be in charge of the Dawson City district when the detachment is ready some time in 1972.

During 1971 a great deal of time was devoted to patrols, in particular along the Dempster Highway, Aishihik Road, Cantung Road, Campbell Highway and the North Canol Road. Air patrols were carried out in the Kluane Game Sanctuary, Whitehorse, Burwash, Watson Lake and the north coastal areas of the Territory.

The fur harvest was estimated to be smaller than the previous year. A fur take of approximately 14,000 pelts for a value of nearly $45,000 has been calculated, based on five elevenths of the total possible returns.

During the 1971 hunting season 22 big game outfitters accommodated 384 non-resident hunters who participated in 5,324 hunting days. Revenue was approximately $612,000 to guides and outfitters. Revenue from the sale of non-resident hunting licences and trophy fees amounted to $59,965.

A number of convictions were obtained for infractions under the Game Ordinance, primarily for persons failing to properly tag an animal taken. This year saw the introduction of a tag system for resident hunters and was very well received.

The wolf bounty was dropped and minor changes in the fur seasons were adopted, while the wolverine was placed on the fur bearer list.

Plans for 1972

The Dawson City detachment will be occupied in the spring and a single side-band radio system installed.

A wildlife biologist and technician will be hired in the spring and a hunter check station will probably be set up on the Dempster Highway this fall. A great deal of effort will be channelled towards work on the Porcupine Caribou herd in conjunction with a program being carried out by the Canadian Wildlife Service over the next two years.

Aerial surveys of sheep in a few local areas are planned, and increased vigilance of

the Alaska-Yukon border, particularly in the extreme southern and northern areas, will be carried out.

Tourism and Information Branch

Responsibilities

The branch is responsible for promoting travel to the Yukon Territory and encouraging the development of tourist attractions and facilities within the Territory.

In addition, it is responsible for public information on government activities.

Long-term Plans

Continued advertising and promotion to stimulate travel to the Yukon, programs designed to assist the development of the Territory's tourist facilities and services, and provision of an adequate information service.

Review of 1971 Operations

Tourism showed a 17 per cent increase, with 180,000 visitors reported. They spent an estimated $12 million.

A completely new literature program was planned and a promotional logo designed. Each day the branch averaged two bulk shipments of literature and 90 inquiries from individuals.

After a market analysis some media were dropped from the advertising schedule, although it was generally expanded and new ads were designed.

The branch became involved in the Klondike Festival, a two-year promotion centred around the Klondike Gold Rush of 1897 and 1898. The promotion is aimed at 75 th anniversary celebrations in 1972 and 1973. The festival is also being supported by Alaska and Washington.

Care of Yukon campgrounds was turned over to the branch, and tourist information centres were open throughout the summer at Watson Lake, Beaver Creek, Haines Junction and Dawson City in the Yukon and at Prince George and Dawson Creek in British Columbia.

A third information officer was added to the staff and improvements made to the photo library. The branch co-operated with the Alaska Travel Division on a border crossing survey. There was increased contact with tourist organizations and the branch worked with a committee attempting to establish a Yukon Visitors Association.

Yukon House in Vancouver completed its first year of operation, providing a variety of information and tourism promotion services. An additional information officer was hired for media relations and the promotion of tourism.

The branch provided more information to travel promotion agencies and the media. Several writers, film crews and travel agents were hosted, and information was provided to many others.

Plans for 1972

- To develop a tourism exhibit for display at travel and sport shows.
- To improve sign posting for campgrounds, historic sites and points of interest.
- To set up a dark room and enlarge the photo library and information services.
- To keep closer touch with news media and travel promotion agencies.
- To keep touch with Yukon organizations and individuals in establishing and improving tourist facilities, services and attractions.

Library Services Branch

Responsibilities

To provide library services to the public and to schools throughout the Yukon.

Long-term Plans

To work towards providing, as closely as possible under Territorial conditions, public and school library service at the level of accepted standards of library service. To co-operate, through the agency of the Yukon Archives, in the development of a Territorial government system of records management for current, non-current, and permanent government records; and to acquire and maintain a collection of the history of the Yukon as recorded in non-governmental sources.

Review of 1971 Operations

With a stock of approximately 69,672 catalogued books, the Yukon regional library served 84 outlets in the various Yukon communities. There were 24,398 books shipped, on a rotating basis, to these communities. The cataloguing of 9,776 new books and added copies was completed. The members of the Whitehorse branch library borrowed 79,044 books during the year. The film library distributed 7,616 16-mm films throughout the Territory which were viewed by a total of 169,063 persons. The Yukon regional library adopted a universal borrower's card which now permits members of the library system to borrow books in any Yukon community using the registration card from their home library and to return those books in any other community. A construction project, to be completed in 1972, which will house the Yukon archives and provide additional space for library services was begun.

Plans for 1972

Branch libraries in Dawson City and Mayo will begin using larger quarters. Increased acquisition funds will allow for enlargement of school and public library collections consistent with the needs of the library system.

DEPARTMENT OF TREASURY

Responsibilities

- Management of the Yukon Consolidated Revenue Fund
- Collection of all taxes and revenues
- Supervision, control and direction of all matters related to the financial affairs of the Territory under the authority of the Commissioner.

Long-term Plans

- Conversion of accounting systems to electronic data processing and the setting up of a data centre for the use of all government departments.
- Introduction of financial management techniques and internal audit procedures.

Review of 1971 Operation

Operating and maintenance expenditures for the fiscal year ending 31 March 1971 increased by $2,496,290 or 18.4 per cent over the previous fiscal year. This increase is primarily attributable to higher wage costs in all government departments, to higher student enrolment in the education system and to increased costs under the health and welfare statutory programs.

The revenue recoveries and operating deficit grant related to operation and maintenance increased for the fiscal year by $460,406 or 3.2 per cent. Increases in this area resulted from normal volume increases, higher expenditures in the cost-shared programs with resulting increased recoveries offset in part by a reduced operating deficit grant.

The overall financial position for operation and maintenance resulted in a deficit of $1,200,975.

Project and Loan Capital

Capital and loan expenditures for the fiscal year ending 31 March 1971 amounted to $7,265,414 of which $2,522,759 was financed through cost-sharing agreements, with the balance being funded by way of loans from the federal government.

The overall position for capital and loan expenditures resulted in a deficit of $191,498.

The deficit spending during the year was financed from working capital and thereby reduced working capital to a minimum. However, it would appear from preliminary estimates that the 1971-72 fiscal year will offer some relief.

Plans for 1972

Planning for the 1972-73 fiscal year has now been completed and it would appear that this year, while presenting the largest budget the Territory has had to date, will be one in which our financial affairs will be reasonably well planned and controlled.

MINISTRY OF TRANSPORT

ARCTIC TRANSPORTATION AGENCY

The Arctic Transportation Agency was formed during 1971 as a component of the Ministry of Transport in Ottawa. It will also have an office in Yellowknife, NWT.

It is responsible for all programs and policies related to Ministry-supported transportation in the northern Territories. The establishment and administration of transportation regulations in the north will remain with the regulatory bodies within the Ministry. The agency is also responsible for carrying out special liaison with the Department of Indian Affairs and Northern Development, departments and governments of the Territories, and other bodies interested in northern transportation.

CANADIAN SURFACE TRANSPORTATION ADMINISTRATION

With a view to determining the economic feasibility of constructing a rail link with the northern British Columbia – Yukon region and the continental railway network, several alternatives were considered. A detailed examination was made of the possible routes. The studies will continue in 1972.

CANADIAN AIR TRANSPORTATION ADMINISTRATION

Airports and Construction Services Branch

Responsibilities

In the north, to operate and maintain airports owned by the Ministry of Transport and to provide comprehensive engineering service and air facilities.

Long-term Plans

To meet the future need for airports in the north, to help develop construction techniques for the Arctic and to provide engineering services consistent with the growth of aviation and northern development.

Review of 1971 Operations

Baker Lake, NWT

Mess hall opened during summer months months on a temporary basis. Approximately $42,900 spent on runway improvements. Commenced extension and widening of runway and construction of an aircraft parking area.

Cape Dorset, NWT

Completed location and design studies for a 4,000–foot landing strip.

Coppermine, NWT

Continued construction of the joint DIAND/MOT project for a 3,000–foot landing strip and access road.

Fort Chimo, Quebec

Completed construction of an air terminal building and two double dwellings. Shipped materials and supplies to site for construction of a sand storage building

Fort McPherson, NWT

Completed pre-construction arrangements for an access road and 3,000–foot landing strip.

Fort Simpson, NWT

Completed an extension to the operations building. Constructed an aircraft taxiway and ramp.

Fort Smith, NWT

Improvements to the seaplane base at Four Mile Lake.

Frobisher Bay, NWT

Relocated firefighters' training area and access road. A new emergency power unit was installed to ensure uninterrupted operation of the VOR. Work commenced on a new instrument landing system.

Inuvik, NWT

Completed installation of a new emergency power unit, also high-intensity runway and approach lights.

Lake Harbour, NWT

Completed a development study for a 2,000–foot landing strip.

Mayo, YT

Runway was extended to 4,500 feet.

Old Crow, YT

Approved design revisions and monitored construction of a 5,000–foot landing strip under construction by DND as part of the Remote Airport Program.

Pangnirtung, NWT

Prepared design revisions and monitored construction of a 3,000–foot landing strip under construction by DND as part of the Remote Airport Program.

Port Burwell, NWT

Completed a development study for a 2,000–foot landing strip and access road.

Resolute Bay, NWT

Construction of crosswind runway continued at a cost of $38,000. Medium-intensity lighting completed at a cost of $27,000. Power plant – approximately $133,000 spent on existing facilities. Replaced field lighting cables and transformers.

Watson Lake, NWT

A maintenance garage, firehall and sand storage complex was constructed.

Whale Cove, NWT

Approved relocation and design of a 3,000–foot landing strip being constructed by DND as part of the Remote Airports Program.

Whitehorse, YT

A new operations building and control tower were constructed.

Yellowknife, NWT

A new emergency power plant was installed and runway improvements were completed.

Plans for 1972

It is anticipated that the projects listed in the review of 1971 operations will be completed in 1972 together with arrangements for their acceptance and transfer.

A construction inspection service is scheduled for Cape Dorset.

At Fort McPherson it is intended to procure construction equipment and commence construction of a landing strip and access road.

The most significant work is planned for Resolute Bay and includes improvements to the sewage system, new power facilities, an ILS installation, replacement of field lighting cables and transformers, increased power generating facilities and the renovation of the interiors of buildings. The cost of this work will be approximately $650,000.

Air Traffic Control Division

Responsibilities

To provide an Air Traffic Control System that will ensure the safe and efficient movement of air traffic within Canadian controlled airspace; and to develop and improve the system to meet the needs of the user.

Long-term Plans

On installation of additional VHF Omni-Range with distance measuring equipment (VOR/DME) facilities and the establishment of additional airways and air routes, ATC service will be enlarged.

Review of 1971 Operations

Air Traffic Control continued to provide area control service for flights operating under instrument flight rules in the Arctic Control Area of Canada. This area extends basically from the 72° North parallel of latitude of the geographical north pole at and above flight level 290. The service provides protection and separation for commercial carriers operating between Europe and the Orient that stage through Alaska, and also a service to domestic flights operating north/south into or out of the Arctic Islands. In support of this service, ATC operates a discrete telephone circuit from the Edmonton Area Control Centre to Cambridge Bay, NWT, with switching arrangements at this point into the Sondrestrom Area Control Centre in Greenland and with the Anchorage Air Route Traffic Control Centre in Alaska.

In the Northern Control Area of Canada, area control service was provided to all flights operating above flight level 230. Flights which benefited from this service and were provided with separation were commercial and military operators flying domestically, operating between Europe and Western North America and between the Eastern seaboard and Alaska.

An additional track was designated to the north of the Preferential Route Structure in northern Canada to assist the movement of traffic between Europe and western North America. The designated track which is identified as "Alpha" extends between Yellowknife, NWT and co-ordinates 72°N, 70°W, off Baffin Island.

Flight Information Service was provided to all known flights in northern Canada and the Arctic regions insofar as was practicable, as MOT has designated the whole area as a Flight Information Region up to the geographical north pole.

An Airport Control Tower remained in operation at the Whitehorse, YT airport.

Plans for 1972

A close watch is being kept on oil exploration and development in the north with a view to providing for any sudden increase in civil aviation requirements in the Arctic and in northern Canada.

Studies are being made by the petroleum industry and the government to determine the feasibility of a pipeline route along the Mackenzie valley. Such a major undertaking would create a demand for improved services along the Mackenzie, especially with regard to the established airports and specially constructed airstrips along the pipeline route.

After considering the growth potential for air services along the Mackenzie Valley, work will begin in April 1972 to establish controlled airways in the low-level airspace (700' above ground to flight level 230) between:

- Yellowknife and Wrigley, NWT,
- Yellowknife, Fort Simpson, NWT and Fort Nelson, BC,
- Hay River, Fort Simpson, Wrigley, Norman Wells, Good Hope and Inuvik, NWT,
- Footner Lake, Alta., and Fort Simpson, NWT.

Also, control zones and control area extensions will be designated at Fort Simpson, Norman Wells and Inuvik.

Whitehorse		
Construct new operations building and tower —	TEC	$391,000
Operations building and tower		$382,200
New tower facilities		3,000
Relocate tower facilities		5,800
TOTAL		$391,000
Yellowknife		
Construct control tower —	TEC	$202,600
Tower		$189,500
Consoles		7,000
Telecom Equipment		6,100
TOTAL		$202,600

Estimated completion date is 1 June 1972.

Inuvik

It is planned to provide an air traffic control service at Inuvik by 1 January 1973. Plans call for the construction of a new tower adjacent to the proposed air terminal building, and the Western Region is preparing the necessary plans and Treasury Board submission for approval of this project. To meet the target date of 1 January 1973, a contract will have to be let before the spring breakup in order that materials and supplies may be shipped to the site. Final costs have not been determined.

CIVIL AVIATION BRANCH

Flight Standards and Regulations Division

Responsibilities

To plan the use of visual and non-visual aids to air navigation. To review operational plans for air services projects. To assist in the planning and co-ordination of air services needs in the north.

Long-term Plans

The long-term plans of the division include the co-ordinating with the geographically responsible regions, of plans for the extension of visual and non-visual aids to navigation in the Arctic. This includes the extension of VHF Omni-Range with distance measuring equipment (VOR/DME) facilities, instrument landing systems (ILS), runway and approach lighting, and visual approach slope indicator systems (VASIS). Long-term plans also include procuring aircraft for flight checking in the Arctic, and the development of appropriate flight checking procedures.

Review of 1971 Operations

The following projects were completed during 1971:

Place	Project	Total Cost
(a) Cambridge Bay	Abbreviated/VASIS	$ 40,100
(b) Fort Reliance	NDB (on test)	70,000
(c) Whitehorse	VOR (85% completed)	300,000

A VASIS for runway 18 and DME for the ILS to runway 36 at Frobisher Bay were to have been completed in 1971, but have had to be deferred as the equipment was shipped too late for installation. A VOR at Whitehorse is 85 per cent complete and is awaiting electronic equipment. This should be available in early 1972 and it is likely to be commissioned about August 1972.

TELECOMMUNICATIONS AND ELECTRONICS BRANCH

Responsibilities

To provide radio aids to air and marine navigation; to provide radio facilities for various scientific organizations and for meteorological observations; to provide other telecommunication facilities as necessary.

Long-term Plans

To expand operations in response to developing technology and an increasing demand; to further develop telecommunication facilities for the transmission and reception of voice and record traffic to additional stations, which includes the administration of services for government needs, and may also include public needs.

Review of 1971 Operations

Omega

The monitoring and recording of the propagation characteristics of Omega navigation system signals is being continued in northern and Arctic regions. This study, which is in co-operation with FAA, US, NRL, USNELC and the US Navy Hydrographic Office employs monitors at four sites: Grande Prairie, Alberta; Resolute, NWT; Coral Harbour, NWT and Frobisher Bay, NWT. Plans have been made for a fifth site at Inuvik, NWT. Data obtained are used to update existing correction tables covering Arctic areas and to assist in further studies intended to determine the predictability of sporadic ionospheric disturbances, polar cap anomalies and other phenomena peculiar to northern and Arctic regions.

Polevault South

The Polevault South tropospheric scatter telecommunications system, consisting of three installations complete with associated equipment at St. Anthony, Cartwright and Goose Bay, was transferred from the United States Air Force to Canadian control on 27 September, 1971.

In accordance with telecommunications Territorial franchise agreements, ownership and subsequent operation of the Cartwright and Goose Bay sites has been assumed by Bell Canada. The St. Anthony site has been transferred to the Ministry of Transport on behalf of the Crown, and will be operated by Canadian National.

Point to point communications in the north

The converting of double side-band (DSB) high-frequency communication circuits in the north to single side-band (SSB) was completed in 1971, resulting in greater reliability.

Aeronautical communications

ICAO communication facilities for transpolar flights were provided at Cambridge Bay, NWT.

Emergency transmitting facilities have been supplied to all ICAO stations in the north, and installation should be completed by the summer of 1972.

Communication service for the atmospheric environment service

A detailed study was made of techniques to improve the radio service for distribution of weather maps in the north. Some of the recommendations may be implemented in 1972, until satellite communication circuits are available in 1973.

A 3KW NDB was installed at Fort Reliance and a 500W NDB at Koartak.

Alert, NWT

The non-directional beacon (NDB) frequency was changed from 530kHz to 305 kHz to bring it within the aeronautical band.

Baker Lake, NWT

The frequency of the Baker Lake high-power NDB was changed from 251kHz to 201kHz to eliminate interference between the Baker Lake and Cambridge Bay non-directional beacons.

Cambridge Bay, NWT

The air-ground frequency 2,868 kHz was commissioned, improving communications with international polar flights.

Churchill, Man.

A VHF omni-directional beacon (VOR) with voice facilities went into service.

Coppermine, NWT
Scheduled weather broadcasts began over the NDB on a 24–hour basis.

Creek Lake, NWT
A NDB was installed.

Frobisher, NWT
A VOR was installed.
The air-ground voice facility on the low-frequency range was transferred to the high-power radiobeacon.

Fort Chimo, P.Q.
A limited ship-shore safety communications service has been established on 2182 and the 2582/2206 kHz channel to provide radio coverage over the southern portion of Ungava Bay.

Fort Smith, NWT
The NDB was moved so as to serve also as the outer marker for the instrument landing system.

Hay River, NWT
An Instrument Landing System (ILS) went into service and the NDB repositioned so as to serve also as the outer marker for the ILS. Transmit facilities were installed on 122.1 MHz for use with aircraft operating at or above 12,000 ft.

Inuvik, NWT
Transmit facilities were installed on 122.1 MHz for use with aircraft operating at or above 12,000 ft.

Koaratak, PQ
A combined marine/aeradio non-directional radiobeacon (NDB) went into service, replacing Cape Hope's advance NDB.

Mayo, YT
Air-ground operation increased to 24 hours daily from 1 May to 30 September, and 16 hours daily during the balance of the year. Scheduled weather broadcasts began over the non-directional beacon.

Norman Wells, NWT
Transmit facilities were installed on 122.1 MHz for use with aircraft operating at or above 12,000 feet.

Resolute, NWT
Transmit and receive facilities were installed on air-ground frequency 122.2 MHz for airport and flight advisory service.

Yellowknife, NWT
Transmit facilities were installed on 122.1 MHz for use with aircraft operating at or above 12,000 ft.

Ionospheric propagation monitoring
A station was activated at Churchill during July 1971 to measure the ionospheric scintillation at VHF and UHF using the satellites LES–6 and ATS–5 respectively. In addition, tone ranging is being conducted through ATS–5. These tests are being conducted in co-operation with the Communication Research Centre, FAA and NASA, to determine margins required on the Aeronautical Satellite System.

Plans for 1972

Fort Chimo, PQ
An instrument landing system is scheduled for installation early in the year.

Fort Nelson, BC
A VOR is planned for 1972.

Fort Reliance, NWT
A high-power (3KW) NDB is operating on test and is expected to be commissioned early in the year.

Fort Smith, NWT
An outer marker for the instrument landing system is to be installed in 1972.

Frobisher, NWT
A VOR has been operating on test during 1971 and is expected to be commissioned in 1972.

Holman Island, NWT
An NDB is planned for 1972.

Port Radium, NWT
An NDB is planned for 1972.

Povungnituk, NWT
An NDB is planned for 1972.

Resolute Bay, NWT
Plans are to establish an instrument landing system during 1972.

Whitehorse, NWT
A VOR and DME is scheduled for operation in August.

Tuktoyaktuk, NWT
Installation of an aeradio station is to start in 1972, to begin operation no later than April 1973. The station will be manned 16 hours a day, providing flight advisory, landing and take-off and weather information service.

Mackenzie River system
Single side-band equipment will be installed on all Canadian Coast Guard vessels on the system in time for the 1972 navigation season.

Future Operations

Domestic telecommunications satellite
TELESAT Corporation of Canada is preparing for the 1973 launching of a Canadian domestic telecommunications satellite. It will be capable of providing high-quality telecommunications over the entire land area of Canada, south of approximately 80°N latitude.

The telecommunications and electronics branch is co-ordinating an assessment of the potential effect of this satellite upon telecommunications systems of the ministry that might lead to extension and improvement of facilities in remote and northern areas.

Arctic facsimile
The telecommunications and electronics branch, in co-operation with the atmospheric environment service, is conducting a feasibility study to determine ways and means of improving and expanding meteorological facsimile services in the Arctic. Sites under immediate consideration are Inuvik, Resolute Bay and Frobisher Bay, with possible improvements to be implemented early in the 1972/73 fiscal year.

CANADIAN MARINE TRANSPORTATION ADMINISTRATION

Operations Branch

Responsibilities
To carry out and co-ordinate the delivery of cargo and passengers for the Canadian government, USAF and commercial concerns; to provide ice and routing information and, when necessary provide ice-breaker support for vessels navigating Arctic waters and the Hudson Bay; to carry out environmental research and surveys as requested by other agencies; to install, operate and maintain marine aids to navigation; to assist with search and rescue operations.

Long-term Plans
To continue to improve navigation in the north and to plan for anticipated resupply needs.

Commercial shipping companies are accepting the Arctic route as a navigable waterway and an increasing number of vessels are using it each year. To provide better support to shipping, the Canadian Coast Guard will have to expand its northern operations by making more extensive patrols and probes and by carrying out more research and survey work.

New techniques such as the Skycrane heavy-lift helicopter will be employed to streamline the Arctic operation. Preliminary

studies are under way for the design of a true Polar icebreaker, a ship capable of year-round operation in the Arctic. This action will save time if it is decided to build such a vessel.

Review of 1971 Operations

The ministry provided five heavy- and two medium-displacement icebreakers for work in eastern Arctic waters, as well as two northern supply vessels and one stevedore depot ship.

The Canadian Coast Guard sealift delivered, shipped and pack-loaded approximately 120,000 tons of cargo into bases and settlements from southern Hudson Bay to Tanquary Fiord. In addition, cargo was carried in a chartered fleet consisting of five dry-cargo vessels and three tankers. Additional cargo was carried on a per ton basis in nine other ships.

The Skycrane helicopter was again employed in 1971. It worked in conjunction with two CSL ships and unloaded approximately 5,600 tons of cargo at 12 different sites. Much of the cargo was construction material, and the Skycrane system permitted most of it to be delivered early in the season, allowing maximum time for construction work.

Eastern Arctic

The CCGS *Labrador* carried out an intensive survey of Viscount Melville Sound and the eastern end of Prince of Wales Strait. Data were sufficiently complete for the development of a new set of charts covering these waters. While sailing north, the ship assisted the cable repair vessel CCGS *John Cabot* in the repair of a broken cable. The *Labrador* also set up Decca stations on Baker Island, Hamilton Island and St. James Island.

The CCGS *Louis S. St. Laurent* carried out an intensive probe of the waters in and around Robeson Channel. She reached Lat. 82°56′ in the Lincoln Sea, about 20 miles north of Alert and less than 450 miles from the north pole; the farthest north ever reached by a surface vessel in the western world.

The CCGS *John A. Macdonald* was engaged in resupply, hydrographic support, and escort duties throughout the central Arctic region. She escorted vessels in Hudson Strait, Ungava Bay and the approaches to Frobisher Bay. The ship opened the harbour at Churchill, Manitoba on July 18. Other points of call included Thule, Greenland; Alert and Eureka.

The CCGS *Narwhal* left Dartmouth, NS in early August for Arctic resupply duty in the Hudson Bay area. The vessel is a depot ship for lighters and lighter crews and has accommodation for approximately 62 stevedores. The *Narwhal* made calls at Seglek Harbour, Resolution Island, Brevoort Harbour, Exeter Bay, Broughton, Cape Christian, Clyde Inlet, Pangnirtung, Hall Beach, Repulse Bay, Igloolik and Cape Dorset.

The ice operations office now established at Frobisher, provided ice information and routing to over 70 vessels, most of them in the Churchill grain trade. More than 20 of these vessles required icebreaker escort, particularly in Hudson Strait, where heavy ice clogged the channel early in the season. However, commercial ships were escorted as far north as Eureka.

Western Arctic

Activities in the western Arctic included icebreaker escort duty, hydrographic work, the placing and servicing of buoys and beacons as well as logistic support for the frozen-sea research group in the Cambridge Bay area. The Canadian Survey Ship *Parizeau* was escorted through the ice pack into the western Arctic from the Pacific by the CCGS *Camsell.*

The CCGS *Skidegate* serviced aids to navigation in the western Arctic.

The four river tenders attached to the Hay River marine services base continued to maintain and improve aids to navigation in the Mackenzie River system.

Plans for 1972

The Canadian Coast Guard intends to intensify its polar icebreaker design program in 1972. It is expected also that the coast guard involvement in support of the hydrographic service will increase. Finally, since trials have proved the value of the helicopter in cargo operations, this method of delivery will probably be expanded in 1972.

Hay River Marine Agency

Responsibilities

The geographic area of administrative responsibility of the Hay River Marine Agency is east from the B.C./Alberta border to the Saskatchewan/Manitoba border, and north of a line drawn through Edmonton, including all the Northwest Territories as far east as the Boothia Peninsula.

The district manager represents the marine services of the ministry on marine matters pertaining to the district, which encompasses the northern coastline of the Northwest Territories and all the navigable, minor and inland waters of the Northwest Territories and Alberta, north of Edmonton. The agency staff directs and administers the construction,operation and maintenance of aids to navigation; the operation of five coast guard ships; the administration and maintenance of government wharves and public harbours, search and rescue activities; the salvage of wrecks; pollution control; and the Navigable Waters Protection Act.

Long-term Plans

Because of the increased amount of shipping in the Arctic, due mainly to oil and mineral exploration, there is a growing demand for more and better navigational aids on the Mackenzie River and tributaries and on the various shipping routes in the Arctic, some of which are newly established. The ministry intends to improve and increase its facilities in order to cope with this demand.

Review of 1971 Operations

A total of 2,380 navigational aids — lighted and unlighted buoys, lighted and unlighted shore aids, radio beacons and radar beacons — was serviced and maintained by this agency with the aid of six vessels, one helicopter and agency personnel. The sixth vessel is the CCGS *Camsell* based at the Victoria Marine Agency. The Hay River Marine Agency was responsible for all aids to navigation in the western Arctic as far east as the Boothia Peninsula. This work was formerly the responsibility of the Victoria Marine Agency.

Thirty-three new shore aids were established. A warehouse was built at Tuktoyaktuk and a new residential home was built at Hay River. A winter program for ship refit and overhaul by ships' engineers was set up at the agency. This program will save considerable money, since these refits were formerly done by contractors at considerable cost.

Plans for 1972

The ministry plans to increase its navigational aids, consistent with the limitations of resources. It is expected that a hovercraft will be in use on the Mackenzie River system to assist in and speed up this work.

NATIONAL ENERGY BOARD

Responsibilities

Pipelines in the north will be regulated by the National Energy Board Act. No interprovincial or extraprovincial pipeline can be built until the board has certified that it is in the public interest, and until the Governor in Council has allowed a certificate to that effect to be issued.

Review of 1971 Operations

The board has been concerned with the special requirements for the design, construction and operation of pipelines in the north with respect to the protection of the environment, and in setting out safety regulations that will apply to pipelines under its jurisdiction. These regulations will be discussed with industry and interested federal government agencies. The board is considering various studies and is following research conducted by federal agencies and departments and industry. Engineers from the board have visited pipeline research sites in northern Canada, Alaska and the USSR. The board has also considered the establishment of a procedure for hearing applications to build northern pipelines.

Plans for 1972

Plans are to continue studies related to the design, construction, operation, maintenance and safety of northern pipelines, and the development of procedures for the hearing of applications to build pipelines.

NATIONAL FILM BOARD

Responsibilities

The production of motion pictures, film loops, filmstrips, slide sets and still photo exhibits about the Canadian north, its people and their activities, its industries, resources, and institutions; the distribution of these materials in Canada and abroad; and the distribution in the north of such material interpreting Canada and exploring issues of national interest; counsel to federal government agencies concerning the application of audio-visual media and the planning, production and distribution of departmental films for information, instruction, training and cultural purposes.

Long-term Plans

Normal planning to meet responsibilities.

Review of 1971 Operations

Staff

No full-time or part-time NFB staff reside in the north. Film crew, trainers, and distribution representatives travel north on assignment.

Film Production

Many films made in 1971 dealt in part with the north, but many also were concerned entirely with northern life. For its own program the board produced *Christmas at Moose Factory,* and *Yesterday, Today. The Conquered Dream* was co-produced with the BBC, and *Une ville Arctic sur un delta*, a filmstrip about Inuvik, was made for Canadian schools.

Some foreign versions of film were made in response to interest from abroad. *Henry Larsen* was produced in a Polish version, and *Odyssée du Manhattan* in Portuguese; *Tuktu and his Animal Friends, Tuktu and the Caribou Hunt*, and *Tuktu and The Magic Bow* in Arabic versions.

The North, the Land and Man and *Search into White Space* were produced for the Department of Indian Affairs and Northern Development. *Assignment Northwest* was produced for the RCMP, and *Arctic Frontier* for the Department of National Defence.

Of particular interest is the project co-sponsored by the board and the Department of Indian Affairs and Northern Development, in which Eskimo artists are helping to make animated films of Eskimo legends. In *The Owl and the Lemming*, produced in 1971 in English, French and Eskimo versions, an Eskimo advised on the story, another created the sealskin puppets, and several others wrote and performed the music and assisted with the sound effects. This series will continue in 1972.

Still photography

Many Happy Returns, an exhibition of 100 photographic prints on the life and activities of the Eskimo, was shown in the Eskimo pavilion at Terre des Hommes.

Distribution

The Board's westernmost distribution region combines B.C. and the Yukon. NFB film services in the Yukon are provided through the Whitehorse Public Library, which has a film section, and also borrows from the NFB Regional Office in Vancouver. The NFB representative in Prince George is responsible for the service.

The remainder of northern Canada continued to be served by the Outpost Film Library in the NFB Ottawa Regional Office.

Advice and organizational help in the Mackenzie district is provided by the board's representative in Edmonton, who makes two trips annually to the north. A preview service is offered from Edmonton, and in 1971 premieres of groups of new films were held in Yellowknife and Hay River.

Plans for 1972

Production

Three projects are intended to enable a small number of northerners to learn techniques of communicating through motion pictures:

- A workshop, designed to teach animation techniques to Eskimos will be held somewhere in the Eastern Arctic, sponsored by the Department of Indian Affairs and Northern Development.
- Collaboration between NFB, the department and northern artists in producing animated films of Eskimo legends will continue.
- The program *Challenge for Change* is available to northerners as a counseling service on video tape communications techniques. It is not yet known whether northerners will make use of this service.

The Board, in co-operation with the CBC Northern Service, is endeavouring to organize the production of large numbers of short items of filmed information to be transmitted in the CBC's northern television service, which is expected to have few commercials. Departments are invited to participate.

Distribution

Before films can be used regularly and effectively, film must be made available locally. Efforts are being made to decentralize the Outpost Film Library to provide the nucleus of a northern film library network, run by northerners, which would serve both adults and schools.

NATIONAL MUSEUM OF MAN

Archaeological Survey of Canada

Responsibilities

To conduct archaeological research on the prehistory of the native peoples of Canada, including research in the Yukon and Northwest Territories, and to make this information available to the public. In 1970 the archaeology division was reorganized as the Aechaeological Survey of Canada, incorporating a new salvage section concerned with recovering information from archaeological sites susceptible to destruction by natural or human activity.

Long-term plans

To find and excavate archaeological sites in the Yukon and NWT, and to compile and analyse the material recovered in an effort to trace the origins and development of the native cultures of the north. The survey will co-operate with other federal and Territorial agencies in salvage operations and in the dissemination of information.

Review of 1971 operations

Dr. R. Morlan carried out a site survey in south-central Yukon, in an area threatened by proposed dam construction. Four archaeologists including three students, conducted research in the north under contract with the Aechaeological Survey of Canada. Excavation and survey work was done in the area of Yellow, Tate, Stewart, and Carcajou lakes, NWT, the junction of the Thelon and Hanbury Rivers in the District of Mackenzie and Chesterfield Inlet, District of Keewatin, NWT. A survey was made of archaeological sites in the area of Fisherman Lake and Fort Liard, NWT.

One student worked in the north on a contract provided by the Margaret Hess Fund for Canadian Studies, conducting an archaeological survey in Cumberland Sound, Baffin Island, NWT.

Dr. Morlan also compiled an archaeological site inventory for the Yukon. Several members of the survey met with representatives of construction companies and agencies of the federal government to plan for future salvage work in the north.

Plans for 1972

Plans are not yet firm, but it is anticipated that all work, particularly salvage operations, will increase this year.

Ethnology Division

Responsibilities

To document the cultural heritage of the native peoples of Canada, including research, material collection, analysis and dissemination of information on the social, linguistic and material culture of the Indians of the Yukon and Northwest Territories.

Long-term Plans

To conduct field and archival research on the cultures of northern indigenous peoples. Staff members direct the work, but much of it is done under contract by outside ethnologists with Indian and Inuit assistants. One aim is to involve greater numbers of Indian and Inuit people in the documentation of their own cultural heritage so they can then use the material to teach their own cultural history.

Review of 1971 Operations

A staff ethnologist conducted research on the Koyukuk River division of the Koyukon peoples. The following studies were made by outside workers under contract:

- Report on Athapascan holdings in the Royal Scottish Museum, Edinburgh.
- Canadian ethnologic holdings in the Pitt-Rivers Museum, Oxford, and the Horniman Museum, London.
- Ethnologic field research among the Hare Athabaskans at Colville Lake, NWT.
- Ethnologic research among the Chipewyan and Métis of Fort Resolution, NWT.
- Ethnologic research among the Dogribs, Chipewyan and Yellowknives at Yellowknife Village, NWT.
- Research on Yukon Indian stories and legends to be published in *My Old People's Stories.*

NATIONAL MUSEUM OF NATURAL SCIENCES

Paleontology Division

Responsibilities

To collect Pleistocene vertebrate material from the Yukon Territory and to describe and catalogue it in an attempt to reconstruct the vertebrate history of the region during the ice age.

Long-term Plans

To continue field work on Pleistocene vertebrates in the Yukon Territory, specifically in the vicinities of Dawson City and Old Crow River, until good representative collections have been established.

Review of 1971 Operations

Collecting operations were conducted near Old Crow River in July and August,

1971. Findings were highlighted by a well-chipped black obsidian point or knife from deposits containing nine species of ice age vertebrates. Collecting continued in the Dawson City area in August.

Plans for 1972

Plans for 1972 call for examination of Pleistocene and Cretaceous fossil deposits in the central Yukon.

Vertebrate Ethology Section

Responsibilities

The zoology division of the National Museum of Natural Sciences is one of the primary contributors to the knowledge of animal species in Canada. Comprehensive faunal surveys are conducted and promoted, and the museum keeps important collections of fauna and flora. Its scientific collections of arctic material are among the best in the world. This division co-operates with other government agencies and scientists of other countries interested in problems of the north.

The vertebrate ethology section is undertaking detailed, long-term studies at Bathurst Island, NWT, to investigate the relationships between species of arctic animals and the behavioural adaptations that enable them to survive in high arctic environments. This small field station permits some university students to undertake research and promotes public interest in conservation in the high arctic.

Long-term Plans

Collaboration with the Polar Continental Shelf Project made it possible to establish a research station at Bathurst Island in 1968, and with continued support the station has become very productive. The research deals with communities and densities of species. It can only achieve its objectives if it can be maintained over a period of at least ten years, a minimum length of time for inter-specific relationships, adaptations to population fluctuations of prey species, and weather conditions affecting them to become apparent. Continuous records of phenological events during the daylight period are essential. The present plan is to continue at least until September 1978. This study emphasizes arctic animals in their undisturbed natural environment, and the research area is now being considered for a possible preserve by the tundra panel of the International Biological Program.

Review of 1971 Operations

The following projects were conducted:

- Ethology of rock ptarmigan. This project was inactive due to absence of birds.
- Social behaviour of ivory gulls. New nesting data and information on distribution; 105 individuals banded.
- Life history, ecology, and behaviour of the collared lemming. New data on rate of population increase and damage to food plants was produced.
- Ecology of king eider. New data was found on extent of predation on eider nests by arctic foxes.
- Competition and behaviour of three species of jaegers related to lemming populations. New data on use of food resources was produced.
- Ethology and ecology of the muskox. A documentation of summer and winter behaviour patterns, and interaction with wolves.
- Life history and ecology of red phalarope. A documentation of nesting behaviour.
- Behaviour and life history of arctic hare. Inactive due to absence of hares.
- Ethology of snowy owl. New data on breeding and non-breeding populations.
- Feeding behaviour and selection of prey by white gyrfalcons with young.
- Collaboration with Federation of Ontario Naturalists in production of a high-fidelity recording of arctic birds for the Sounds of Nature series.
- Life History of king eider.
- Botanical collection and special studies of genus *draba* and *potentilla*.

Plans for 1972

Most of the projects are continuations of those established in 1968. Some may become temporarily inactive when the species under study is present in very small numbers, does not breed, or is absent. Established projects tend to become more elaborate over a period of years. The projects listed for 1971 will continue, except as follows:

- The study of the rock ptarmigan will be reactivated if the population warrants it, and will expand to include studies of anatomy, vocal structures, and pterylosis.
- The studies of genus *diaba* and *potentille* will be replaced by botonical studies of sedge meadows.
- A study of the ethology and annual cycle of the sanderling will be reactivated.
- Radio-location telemetry will be introduced to monitor movements of animals with cryptic behaviour.

NATIONAL RESEARCH COUNCIL OF CANADA

Responsibilities

To investigate various phases of pure and applied sciences in northern Canada.

Long-term Plans

Several divisions of the National Research Council have a continuing interest in the north.

From stations in northern Canada, the division of physics is conducting studies of space radiation. They include ground-based cosmic ray observations and rocket measurements of charged particles in the earth's magnetosphere.

The division of building research conducts studies of permafrost, snow and ice and problems related to construction in the north.

The radio and electrical engineering division carries out radio and optical measurements of upper atmospheric phenomena; for example, auroral and air glow observations. These observations are made using both ground-based techniques and rocket launches.

The space research facilities branch operates the Churchill research range, the Great Whale geophysical station, and a launching facility at Resolute Bay. It co-ordinates scientific research at these and other locations in Canada.

Other divisions of the National Research Council carry on work in the north on a short-term basis. For example, the ship and marine dynamics laboratory of the division of mechanical engineering is concerned with the design and development of ice breakers and problems caused by ice in the north.

Review of 1971 Operations

Division of Physics

Continuous monitoring of cosmic ray intensities was carried out at five stations in northern Canada: Resolute, Churchill, Alert, Inuvik and Goose Bay. This work is part of an international study based on a network of cosmic ray stations and is carried out in collaboration with Atomic Energy of Canada Limited, Chalk River, and the Southwest Center for Advanced Studies in Dallas, Texas.

During 1971 experiments were sent up from Fort Churchill on three rockets as part of a continuing study of the charged particles responsible for aurora and other geophysical effects. Results have been obtained in a number of areas and have been published in several papers.

Division of Building Research

Ground temperature measurements were continued at eight sites near Yellowknife, NWT and at seven sites on mountain summits in British Columbia, as part of the long-term studies of the distribution of permafrost in Canada. In 1971 five additional ground temperature cables were installed at mountain sites in British Columbia and 12 cables were installed on Devon Island in the Arctic archipelago.

Support for various engineering and terrain studies of permafrost being conducted in northern Manitoba was provided by a small field station operated by the division at Thompson. Investigations of microclimate and terrain factors influencing the distribution of permafrost were continued and expanded with the installation of special equipment at Thompson test sites. Studies of previous dykes constructed on thawing permaforst were carried on at the Kelsey and Kettle generating stations on the Nelson River in co-operation with Manitoba Hydro. Field trials to evaluate the suitability of a "pressuremeter" device for measuring the strength and deformation characteristics of frozen ground in situ were conducted at Thompson in July. A study of the influence of heat conduction along foundations on the ground thermal regime began with the installation in September of steel posts and instrumentation at a test site at Thompson. Ground temperature observations of a buried water supply line were continued at Churchill in a co-operative study with the Department of Public Works.

As part of a series of studies on problems associated with the construction of oil and gas pipelines in northern Canada, equipment is being developed and studies done to investigate, in the laboratory and the field, the thermal properties and the thaw settlement characteristics of permafrost. In co-operation with Mackenzie Valley Pipeline Research Limited (a consortium of 16 oil and pipeline companies) a "hot oil" test pipe loop was installed in permafrost at Inuvik, NWT. Procuring, shipping and storing permafrost samples and preparing them under controlled temperature conditions for field and laboratory tests was also tried. The long-term performance of various structures on permafrost at Inuvik, including the airstrip and buildings supported by piles and duct-ventilated gravel pads, was assessed as part of a continuing observation program. Numerical models were developed for computer application in the investigation of the ground thermal regime around pipelines and under roads in permafrost areas.

Studies of the engineering problems caused by lake and river ice and analysis of the data obtained from many sites in Canada, including some in the north, were continued. This work requires an evaluation of ice pressure on structures, the bearing capacity of ice covers, the prediction of break-up dates of lake and river ice and the control of river ice.

Advice and assistance were given on a number of building and geotechnical

problems in the north brought to the division by various engineering firms and federal and provincial departments and agencies.

Radio and Electrical Engineering Division

Instrumental auroral observations in the visible region of the spectrum were made from the auroral observatory at Fort Churchill and from Gillam, Manitoba during selected periods in February and March. The production of visual auroral reports from meteorological stations ended in the summer of 1971.

Auroral radar equipment was operated continuously at Poste-de-la-Baleine (Great Whale River), P.Q., and at Churchill and Thompson, Manitoba.

During 1971 plasma probes were flown on seven rockets launched at Churchill. Micrometeoroid detectors were placed on rockets fired from Churchill.

During 1971, DA–3 auroral all-sky cameras were in operation at Poste-de-la-Baleine, P.Q., Moosonee, Ontario, and Churchill, Manitoba. The Great Whale cameras were used on a conjugate-point program with identical cameras operated at Byrd Station in the Antarctic. Photoelectric auroral photometers, using interference filters, were also used at Great Whale and Byrd. During August and September 1971 two automatic auroral photometer stations operated at Sanikiluaq Harbour in the Belcher Islands, and on an uninhabited islet halfway between the Belchers and the Quebec mainland.

Space Research Facilities Branch

The NRC, through its space research facilities branch, continued to operate the Churchill research range during 1971. Tests included the launching of sounding rockets and balloons to investigate geophysical phenomena in the upper atmosphere for scientists from Canada, the United States and other countries. Associated ground-based experiments were also performed by scientists from various universities participating in the rocket program.

Two rockets were launched for the United States from Resolute, NWT during 1971.

In March 1971, NASA launched eight Nike Tomahawk rockets from Hall Beach, NWT with NRC providing safety co-ordination.

The space research facilities branch was also responsible for co-ordinating various co-operative scientific programs at the Great Whale geophysical station. These facilities have been used occasionally in connection with balloon launches from the Churchill Research Range. In 1971 arrangements were made with the government of Quebec and the federal Ministry of Transport for the use of additional buildings at Great Whale to accommodate ionosonde equipment from the University of Alaska and an ATS satellite communications facility from NASA. The equipment was provided to enable this station to support a Barium Cloud experiment which was carried to a point approximately seven earth radii above the equator by a rocket launched from Wallops Island, Virginia on 21 September 1971.

Plans for 1972

Division of Physics

It is planned to continue both the cosmic ray monitoring and the rocket program in 1972. However, the cosmic ray study is under review and it is likely that the station at Resolute will be closed down. The rocket program will probably be maintained at about the same level as in 1971.

Division of Building Research

Surveys of the distribution of permafrost will be continued at Yellowknife, Devon Island and the mountains of British Columbia. Ground temperature cables will be installed at Churchill, Rankin Inlet and Ennadai Lake. The micro-climate and terrain studies of permafrost will be carried on at Thompson.

In co-operation with the departments of Indian Affairs and Northern Development, Public Works, and the Ministry of Transport a study of insulated roads built on permafrost will begin with the construction of two test sections at Inuvik, NWT. Several sizes and types of foundation will be built at Thompson, and measurements of uplift forces on them due to heaving of frost-susceptible soils will be made.

Studies of the performance of engineering structures and facilities on permafrost will be continued at Inuvik, NWT and Thompson, Gillam and Churchill, Manitoba. Equipment development and field and laboratory investigations of the stability and settlement characteristics and the thermal properties of frozen and thawing soils will be carried out. There will be further co-operative studies with the petroleum industry of geotechnical problems associated with the construction and operation of pipelines in permafrost.

Laboratory and field investigations of the lateral and uplift forces exerted on structures by moving ice and ice covers subject to an increase in water level will be conducted. Deformation and strength measurements of ice will be continued in the laboratory.

Radio and Electrical Engineering Division

Instrumental equipment for the observation of aurora and airglow will be in routine use at Poste-de-la-Baleine, Churchill, Thompson, and Moosonee. Auroral observations in the visible and infrared portions of the spectrum will be made during January 1972 from the auroral observatory at Fort Churchill and from Gillam, Manitoba.

The network of auroral radars, including Churchill, Thompson, and Great Whale, will continue in operation.

Upper atmosphere rocket experiments will be launched from Churchill and from Gillam. These rockets will carry plasma probes, photometers, and micrometeoroid detectors.

Space Research Facilities Branch

The Churchill research range will continue to be used for the launching of sounding rockets and balloons to investigate geophysical phenomena in the earth's atmosphere and in space for scientists from Canada, the United States and other countries.

Two further U.S. rockets, scheduled to be launched from Resolute in September 1972, will be launched by NRC on behalf on NASA's Goddard Space Flight Center and the University of California.

Early in 1972 a series of scientific sounding rockets to make measurements over as wide a latitude as possible will be launched, one from Gillam in conjunction with four others from the Churchill Research Range.

The Great Whale geophysical station will continue its work of auroral photography and photometry, and making a variety of radio-frequency measurements for Canadian and U.S. agencies. Facilities at Great Whale will be used to supplement those at Churchill research range in conjunction with rocket and balloon-borne experiments.

NORTHERN CANADA POWER COMMISSION

Responsibilities

To provide public utilities in the Yukon and Northwest Territories as authorized by the Governor-in-Council. To operate each plant on a self-sustaining basis, including repayment of capital.

Long-term plans

Forecasting and normal planning in order to establish, maintain, and expand electrical and utility services.

Review of 1971 Operations

Northwest Territories

Plant	*Utilities*	*KW Capacity*	*Net Generation KWH X 1000*	*Staff*	*Consumers*	
Taltson (Hydro)	Power	18,000	117,179	(12	2 (wholesale)	
Fort Smith distribution system (diesel		960		(		
(gas turbine)		1,500		(	737	
Pine Point distribution system		5,150		(	356	
Inuvik (diesel & steam)	power	10,210	18,525	44		931
	heat				1,310	129
	water & sewerage					240
	mtce. services					
Fort McPherson (diesel)	power, heat	750	1,393	8	181	
(service operated for NWT gov't.)	water, sewerage					
	mtce. services					
Fort Simpson (diesel)	power, heat	1,465	3,347	23	372	305
(services operated for NWT gov't.)	water, sewerage					
	mtce. services					67
Aklavik (Diesel)	power	742	1,230	4	62	
(operated for NWT gov't.)						
Frobisher Bay (diesel)	power, heat	9,005	12,096	32	814	
	water, sewerage					
Fort Resolution (diesel)	power	450	Nil	3	147	

(Continued on next page)

Review of 1971 Operations (cont'd)

Northwest Territories (cont'd)

Plant	*Utilities*	*KW Capacity*	*Net Generation KWH X 1000*	*Staff*	*Consumers*
Chesterfield Inlet (diesel)	power	400	470	3	57
Snare River (hydro)	power	14,000		(	
(Snare Rapids)				(	
(Snare Falls)			98,932	(14	4 (wholesale)
standby diesel		6,710		(	
Rae distribution system	power				183
Cambridge Bay (diesel)	power	1,200	2,565	5	46
Coppermine (diesel)	power	600	1,045	5	132
Baker Lake (diesel)	power	1,354	1,785	3	194
Fort Good Hope (diesel)	power	375	687	1	71
Norman Wells (diesel)	power	1,400	2,984	3	68
Yukon Territory					
Mayo (hydro)	power	5,100	35,085	3	193
(diesel)		300			2 (wholesale)
Whitehorse (hydro)	power	19,390	156,888	16	
(diesel)		14,220			6 (wholesale)
Faro distribution system		5,150		1	381
Dawson (diesel)	power	1,200			(562)
	water & sewerage	2,781	2,781	8	832 total (270)
Tuktoyaktuk (diesel)	power	750	1,100	1	138
Fort Norman (diesel)	Power	350	400	1	73
Fort Franklin (diesel)	power	650	500	1	79
Rankin Inlet (diesel)	power (Aug. 1971)	1,175	900	7	147

SNARE/YELLOWKNIFE, NWT

- An extension to Jackfish diesel plant to provide space for an operator's booth, washroom facilities, storage and work area was completed.
- Construction of approximately seven miles of 34.5 KV transmission line from Yellowknife to the Yellowknife Indian Village was completed.
- The standby diesel plant in Yellowknife, damaged by fire in 1970, was renovated put back in service.
- Alterations and modifications to the Yellowknife terminal station to accommodate additional transmission facilities were completed.
- A section (approximately 37 structures) of the 115 KV transmission line between Snare hydro plants and the Yellowknife terminal station was rebuilt.

TALTSON/FORT SMITH/PINE POINT, NWT

- A new building to house the Fort Smith standby generating units and provide additional storage and garage space, as well as provide a future training centre, was completed. The 1,500 KW gas-turbine standby generating unit was moved from its temporary location to the new building.
- Installation began on an additional 5 KV circuit breaker at Fort Smith to isolate the Fort Smith distribution system and standby generating equipment from the 115 KV Taltson transmission system, and to provide changeover from diesel to hydro power without interruption.
- The installation of a 5,150 KW diesel-electric generating unit at Pine Point, which began in 1970 to provide standby power for Pine Point and Pine Point Mines, was completed.
- Construction of 20 miles of 7.2 KV, single-phase, ground return transmission line from Fort Smith to Salt River began and is expected to be completed in early 1972.
- Construction of 20 miles of 7.2 KV, single-phase, ground return transmission

line from Pine Point to Buffalo River was completed.

- A power line carrier to provide communications between Fort Smith and Pine Point was installed.
- A switching structure and equipment for a second 12 MVA power transformer was being installed at Pine Point substation to provide additional capacity.
- A 2,000 KVA synchronous condenser was installed and provision for a static capacitor bank was being made at Pine Point substation to improve voltage regulation.

MAYO, YT

- Automatic greasing for the Mayo hydro unit was installed, as part of the automation of the plant in anticipation of future unattended operation and remote control of the plant.

FORT SIMPSON, NWT

- Construction of a new powerhouse building and temporary installation of a 700 KW diesel-electric generating unit was completed, increasing the installed generating capacity at Fort Simpson to 2,150 KW.

WHITEHORSE/FARO, YT

- The installation of a 5,150 KW diesel-electric generating unit at Faro, begun in 1970 to provide a standby power supply for Faro and Anvil Mines, was completed.

INUVIK, NWT

- The installation of a 5,150 KW diesel-electric generating unit, which commenced in 1970, was completed early in the year, bringing the installed generating capacity at Inuvik to 10,200 KW.
- A new 90,000,000 Btu per hour high-temperature water generator was purchased for installation in 1972.
- The power distribution system was expanded to provide for two additional feeders from the generating plant.
- Improved fuel off-loading docking facilities were installed.
- Approximately 6,800 ft. of water and sewer utilidor was installed for the NWT Government.
- Approximately eight miles of distribution system was upgraded from 7.2 KV to 12.5 KV to improve voltage conditions at the MOT airport.
- Installation of an automatic fire extinguishing system in the new power plant was completed.

FROBISHER BAY, NWT

- Installation of a 15,000,000 Btu per hour heat exchanger for conversion of steam to high-temperature water to augment the existing high-temperature water system was completed.
- Installation of an automatic fire extinguishing system in the power plant building was started and is expected to be completed by mid-1972.
- Provision of high-temperature water, sewer, and domestic water service to the new elementary school, RCMP building, and Hudson Bay Co. building was completed.

FORT RESOLUTION, NWT

- Construction of 45 miles of single-phase, ground return, 34.5 KV transmission line from Pine Point to Fort Resolution, begun in 1970, was completed to supply hydro power to the community, placing the diesel plant on a standby basis.
- Automation of the standby diesel plant to provide for 16—hour unattended operation was completed.

AKLAVIK, NWT

- Investigations on the feasibility of building a 34.5 KV, single-phase transmission line between Inuvik and Aklavik to service the community from Inuvik was started and is expected to be completed by mid-1972.

DAWSON, YT

- Installation of an additional 500 KW diesel-electric generating unit and automating of the unit to provide for 16—hour unattended operation was completed, increasing the installed generating capacity at Dawson to 1,500 KW.
- Purchase and installation of a 3.5 million Btu per hour steam boiler for heating of the community water system was completed at the request of the Yukon government.

COPPERMINE, NWT

- Installation of an additional 250 KW diesel-electric generating unit and automating of the unit to provide for 16—hour unattended operation was started and is expected to be completed by mid-1972.
- Major alterations to three employee housing units, including water and sewer and heating improvements, were completed.

CAMBRIDGE BAY, NWT

- Installation of an additional 560 KW diesel-electric generating unit, including automating of the unit to provide for 16—hour unattended operation, was completed, thereby increasing the installed generating capacity at Cambridge Bay to 1,650 KW.
- Construction of two employee housing units was completed.

NORMAN WELLS, NWT

- Construction of one employee housing unit was completed.

CHESTERFIELD INLET, NWT

- Construction of a new diesel plant building combined with garage and storage space was completed.
- Installation of an additional 300 KW diesel-electric generating unit suitable for 16—hour unattended operation was completed, thereby increasing the installed generating capacity at Chesterfield Inlet to 700 KW.

FORT GOOD HOPE, NWT

- Construction of one employee housing unit was completed.
- Installation of an additional 300 KW diesel-electric generating unit suitable for 16—hour unattended operation was completed, increasing the installed generating capacity at Fort Good Hope to 675 KW.

TUKTOYAKTUK, NWT

- Responsibility for the generation and distribution of electric power in Tuktoyaktuk was assumed by the commission from the NWT Government on 1 April 1971.
- Installation of an additional 300 KW diesel-electric generating unit was arranged on a temporary basis, thereby increasing the installed generating capacity at Tuktoyaktuk to 750 KW.
- Investigations were completed, materials purchased and supplied, and construction commenced on a 69 KV transmission line

between Inuvik and Tuktoyaktuk to service the community from Inuvik. The Tuktoyaktuk diesel plant will operate on a standby basis only.

FORT FRANKLIN, NWT

- Responsibility for the generation and distribution of electric power in Fort Franklin was assumed by the commission from the NWT government on 1 April 1971.
- Installation of an additional 300 KW diesel-electric generating unit was arranged, increasing the installed generating capacity at Fort Franklin to 650 KW.

FORT NORMAN, NWT

- Responsibility for the generation and distribution of electric power in Fort Norman was assumed by the commission from the NWT government on 1 April 1971.
- Installation of an additional 150 KW diesel-electric generating unit commenced and is expected to be completed early in 1972. Upon completion, the installed generating capacity at Fort Norman will be increased to 500 KW.

RANKIN INLET, NWT

- Responsibility for the generation and distribution of electric power in Rankin Inlet was assumed by the commission from the NWT government on 17 August 1971.
- A 500 KW diesel-electric generating unit was supplied and temporarily installed in the existing diesel plant to replace worn-out equipment, bringing the total generating capacity to 1,175 KW.
- Purchase and supply of a new diesel plant building to be installed in 1972 was completed.
- Construction of two employee housing units was completed.

GJOA HAVEN, NWT

- Installation of two 150 KW diesel-electric generating units on behalf of the NWT government was completed, including the conversion of the electrical distribution system from single phase to three phase.
- Preliminary arrangements were completed before assuming responsibility for the generation and distribution of electric power in Gjoa Haven from the NWT Government early in 1972.

SPENCE BAY, NWT

- Installation of two 150 KW diesel-electric generating units on behalf of the NWT Government was completed, including the conversion of the electrical distribution system form single phase to three phase.
- Preliminary arrangements were completed before assuming responsibility for the generation and distribution of electric power in Spence Bay from the NWT government early in 1972.

HOLMAN ISLAND, NWT

- Preliminary arrangements were completed before assuming responsibility for the generation and distribution of electric power in Holman Island from the NWT government early in 1972.

WHALE COVE, NWT

- Responsibility for the generation and distribution of electric power in Whale Cove was assumed by the Commission from the NWT government on 15 December 1971.

ESKIMO POINT, NWT

- Responsibility for the generation and distribution of electric power in Eskimo Point was assumed by the Commission from the NWT government on 16 December 1971.

CAPE DORSET, NWT

- Preliminary arrangements were completed before assuming responsibility for the generation and distribution of electric power in Cape Dorset from the NWT government early in 1972.

PELLY BAY, NWT

- Preliminary arrangements were made before assuming responsibility for the generation and distribution of electric power in Pelly Bay from the NWT government early in 1972.

Plans for 1972

SNARE/YELLOWKNIFE, NWT

- Remote supervisory control of Jackfish diesel plant from the Yellowknife Control Centre and automation of the diesel plant for 16—hour unattended operation.
- Installation of a fire detection system at Snare hydro plants and a fire protection system at Jackfish deisel plant.
- Provision of an additional 3,000 bbl. of fuel oil storage.
- Construction of NWT regional warehousing facilities.
- Construction of three employee housing units.

TALTSON/FT. SMITH/PINE POINT, NWT

- Installation of switchgear in new powerhouse at Ft. Smith.
- Installation of fire detection systems in the Taltson hydro plant and Ft. Smith diesel plant.

MAYO, YT

- Relocation of employee housing from hydro site to Mayo townsite.
- Installation of a fire protection system in the hydro plant and diesel plant.

FORT SIMPSON, NWT

- Installation of switchgear in the new powerhouse.
- Installation of a 1,000 KW diesel-electric generating unit in the new powerhouse.
- Installation of a fire detection system in the new powerhouse.
- Increase fuel storage capacity by 3,000 bbl. and begin relocation of storage tanks.

WHITEHORSE/FARO, YT

- Complete automation of diesel plant in Whitehorse for 16—hour unattended operation and remote control from the hydro plant.
- Installation of fire protection system in the Whitehorse and Faro diesel plants and a fire detection system in the Whitehorse hydro plant.
- Landscaping and fencing of the Whitehorse and Faro plants.

INUVIK, NWT

- Installation of H.T.W. boiler, purchased in 1971, in the new powerhouse building.
- Improvement to lighting system in old powerhouse building and preparing building for standby.
- Purchase of an all terrain vehicle for transmission line maintenance.
- Installation of a fire detection and protection system in the old powerhouse building.

FORT MCPHERSON, NWT

- Installation of an additional 500 KW diesel-electric generating unit and two 375 KW generators on existing diesel units, replacing 250 KW generators.
- Automation of the diesel plant for 16—hour unattended operation.
- Installation of a fire protection system in the diesel plant.
- Modifications and improvements to the fuel storage and fuel supply system.
- Construction of one employee housing unit.

AKLAVIK, NWT

- Installation of a 375 KW generator on an existing diesel unit to replace a 250 KW generator.
- Installation of a fire detection system in the diesel plant.

DAWSON, YT

- Improvements to the diesel plant ventilation system.
- Modifications and improvements to the diesel plant fuel storage.
- Construction of one employee housing unit.

COPPERMINE, NWT

- Installation of a 375 KW generator on an existing diesel unit to replace a 250 KW generator.
- Installation of a fire protection system in the diesel plant.
- Automation of the diesel plant for 16—hour unattended operation.

CAMBRIDGE BAY, NWT

- Installation of an additional 3,000 bbl. of fuel oil storage.
- Automation of the diesel plant for 16—hour unattended operation.
- Installation of a fire detection system in the diesel plant.

NORMAN WELLS, NWT

- Installation of a 700 KW diesel-electric generating unit and removal of a 200 KW unit.
- Installation of a fire detection system in the diesel plant.
- Construction of an employee housing unit.

BAKER LAKE, NWT

- Installation of a fire protection system in the diesel plant.
- Installation of an additional 3,000 bbl. of fuel oil storage.
- Automation of the diesel plant for 16—hour unattended operation.

CHESTERFIELD INLET, NWT

- Installation of a fire detection system in the diesel plant.
- Installation of two 15,000—gallon fuel storage tanks to increase storage capacity.

FORT GOOD HOPE, NWT

- Installation of a fire protection system in the diesel plant.

TUKTOYAKTUK, NWT

- Complete construction of a 69 KV transmission line between Inuvik and Tuktoyaktuk to service the community from Inuvik, and conversion of the diesel plant to a standby plant.
- Installation of a fire detection system in the diesel plant.

FORT FRANKLIN, NWT

- Automation of the diesel plant for 16—hour unattended operation.
- Installation of a fire protection system in the diesel plant.

FORT NORMAN, NWT

- Automation of the diesel plant for 16—hour unattended operation.
- Installation of a fire protection system in the diesel plant.

RANKIN INLET, NWT

- Installation of a new powerhouse building purchased and supplied in 1971.
- Installation of two new 700 KW diesel-electric generating units and installation of an existing 500 KW unit in the new powerhouse.
- Installation of a fire detection system in the new diesel plant.
- Construction of two employee housing units.
- Installation of 6,000 bbl. of fuel oil storage capacity.

GJOA HAVEN, NWT

- Assume responsibility for generation and distribution of electric power in Gjoa Haven from NWT government.
- Installation of a fire detection system in the diesel plant.

SPENCE BAY, NWT

- Assume responsibility for generation and distribution of electric power in Spence Bay from NWT government.
- Installation of a fire detection system in the diesel plant.

HOLMAN ISLAND, NWT

- Assume responsibility for generation and distribution of electric power in Holman Island from NWT government.
- Installation of two 150 KW diesel-electric generating units, including the conversion of the electrical distribution system to three phase.

WHALE COVE, NWT

- Installation of an additional 150 KW diesel-electric generating unit.

ESKIMO POINT, NWT

- Installation of an additional 300 KW diesel-electric generating unit.

CAPE DORSET, NWT

- Assume responsibility for generation and distribution of electric power in Cape Dorset from NWT government.
- Installation of an additional 300 KW diesel-electric generating unit.

PELLY BAY, NWT

- Assume responsibility for generation and distribution of electric power in Pelly Bay from NWT government.
- Installation of two additional 40 KW diesel-electric generating units.

ARCTIC RED RIVER, NWT

- Assume responsibility for generation and distribution of electric power in Arctic Red River from NWT government.

SACHS HARBOUR, NWT

- Assume responsibility for generation and distribution of electric power in Sach's Harbour from NWT government.

HALL BEACH, NWT

- Assume responsibility for generation and distribution of electric power in Hall Beach from NWT government.
- Installation of 3,000 bbl. of fuel oil storage capacity.

IGLOOLIK, NWT

- Assume responsibility for generation and distribution of electric power in Igloolik.

REPULSE BAY, NWT

- Assume responsibility for generation and distribution of electric power in Repulse Bay.
- Installation of an additional 100 KW diesel-electric generating unit.

CORAL HARBOUR, NWT

- Assume responsibility for generation and distribution of electric power in Coral Harbour.
- Installation of new powerhouse building.
- Installation of a 200 KW diesel-electirc generating unit in the new powerhouse.
- Consider construction of seven miles of transmission line out of Coral Harbour to serve MOT site.

LAKE HARBOUR, NWT

- Assume responsibility for generation and distribution of electric power in Lake Harbour.

PANGNIRTUNG, NWT

- Assume responsibility for generation and distribution of electric power in Pangnirtung from NWT government.

BROUGHTON ISLAND, NWT

- Assume responsibility for generation and distribution of electric power in Broughton Island from NWT government.

NORTHERN TRANSPORTATION COMPANY LIMITED

Responsibilities

Northern Transportation Company Limited has operated throughout the Mackenzie River system and the western Arctic coast for 40 years. The company's marine operation has provided the principal freight service for communities along the route and furnishes logistic support for oil, gas and mineral exploration and development. Since 1944, N.T.C.L. has transported more than 3.5 million tons of freight over its 4,800 mile system. The company has a fleet of three ocean-going ships, 28 diesel tugs and 145 all-steel, dual-purpose barges with capacities of up to 1,500 tons, providing a registered aggregate gross tonnage of 58,000 tons. During the normal May to October navigating season, N.T.C.L. employs more than 550 persons, many of whom are residents of the region it serves.

Review of 1971 Operations

In 1971, N.T.C.L. transported a record 283,321 tons of cargo. This included a substantial volume of exploration and drilling equipment, most of which was shipped after August. Despite a serious drop in the water level late in the season and the large amount of cargo for shipment during that period, resupply operations were successfully completed before freeze-up. Winter warehousing and forwarding services began in the winter of 1971. It is expected that this type of shore-related business will increase, resulting in more opportunities for year-round employment.

N.T.C.L. continued to improve its terminal and shore installations throughout 1971. A new freight terminal on a 38—acre site at Inuvik is part of the plan to improve the company's shipping and storage facilities in the Mackenzie delta. A new 60—acre heavy equipment terminal at Hay River, particularly suited to the handling of heavy oil field equipment and large-diameter pipeline materials, was also opened. The new installation includes over 1.5 miles of railroad siding and 950 linear feet of wharfage. It has a loading capacity of 10,000 tons of cargo a day, and storage space for over 30,000 tons. Major construction at Hay River in 1971 was the initial phase of a $5 million syncrolift capable of handling vessels of up to 1,770 long tons.

Plans for 1972

If a large-diameter gas pipeline is constructed along much of the Mackenzie River route in the early 1970s the company can expect an increase in community resupply and resource development cargo. Increased dredging and other river channel improvements will prove a more economic way of achieving greater capacity than would the acquisition of additional marine equipment.

Major construction by the company in 1972 will be the continuation of work on the new shipyard at Hay River and the improvement of freight handling facilities at Hay River and Inuvik. The repowering and refitting of two vessels is also planned. Under a contract from the Ministry of Transport, N.T.C.L. will operate a 40-gross-ton Bell Voyageur air cushion vehicle freighter during an evaluation scheme expected to last until the second half of 1973. It is also planned to introduce freight containerization wherever feasible.

Long-term Plans

In 1971, N.T.C.L., the Ministry of Transport and the departments of Indian Affairs and Northern Development, and Energy, Mines and Resources, participated in a comprehensive economic study of transportation needs in the Mackenzie River basin for the period to 1985. Based on a computer model, the study will assist both the government and the company in planning expansion of the transportation network.

POST OFFICE DEPARTMENT

Responsibilities

To provide mail service to and from post offices in the Yukon and Northwest Territories.

Long-term Plans

Subject to the availability of transportation, to provide adquate mail service at an equitable cost.

Review of 1971 Operations

Transportation

New services were established between Hay River and Fort Resolution, and Hay River and Fort Smith. Courtesy bag service is now provided for Fort Reliance and Paulatuk, NWT. Mail transportation costs for NWT were $1,584,828

The Dawson Creek – Whitehorse highway service was increased from twice a week to three times a week in August, 1971. The Whitehorse – Ross River service has been increased to serve Faro six days a week and Ross River three days a week. Mail transportation costs for Yukon Territory were $814,749.

Post offices in operation

New post offices were opened at Faro and Quill Creek in the Yukon Territory, and at Pelly Bay and Gjoa Haven in the Northwest Territories. At Hay River, a new postal station, Vale Island, has been opened.

There are 28 post offices in operation in the Northwest Territories, and 19 in the Yukon Territory. Salary expenditures for these offices amounted to $312,577 in the NWT and $285,603 in the Yukon. Revenues were $392,526 and $318,537 respectively.

Letter carrier delivery service

Letter carrier delivery service was inaugurated at Whitehorse on 18 September 1971, with three carriers on foot serving the business community and four mail-mobiles serving the residential area. A total of 2,563 calls were made on inauguration. The letter carrier delivery area will be extended south to take in a large trailer court and northward to take in part of the Porter Creek area. These extensions will be made during the early months of 1972 and should take in approximately 300 more drops. The remainder of the Porter Creek area will be taken in as the area qualifies for service.

Plans for 1972

To continue to provide adquate postal service, commensurate with cost.

ROYAL CANADIAN MOUNTED POLICE

Responsibilities

The basic responsibility is the preservation of peace, the prevention and detection of crime, and the maintenance of law and order. The RCMP is the only law enforcement agency in the north, and is responsible for enforcing all federal statutes, territorial laws and, through agreement with six municipalities, municipal by-laws in the communities of Dawson, Whitehorse, Yellowknife, Hay River, Fort Smith and Inuvik.

Long-term Plans

Long-term plans call for the transfer of detachments, the adjustment of boundaries and reallocation of manpower and resources as continuous evaluation indicates the need. Priorities are frequently changed by both the rapid influx of oil and exploration crews into various areas, and the gradual growth of the larger industrial centres within the Territories.

Review of 1971 Operations

The new administration building at Frobisher Bay was completed in the summer of 1971, and occupied on 27 September. The new building houses Frobisher Bay subdivision headquarters, Frobisher Bay detachment, single quarters, telecommunications section and guardroom facilities.

A new detachment building with married quarters was erected at Faro, YT, to house the expanded operations that were established there in 1970.

A new detachment building with married quarters was also built at Fort McPherson.

Plans for 1972

Plans for 1972 include the move to the new married quarters now under construction at Fort Resolution, NWT.

A police service dog section is being established at Yellowknife in 1972, for use throughout the area.

AGRICULTURE DIVISION

Responsibilities

To collect and publish data on the number of wildlife pelts taken.

Long-term Plans

No change is contemplated.

Review of 1971 Operations

Fur Production — Data were obtained on the number and value of pelts taken in both regions for the fur season 1970-71. The number of pelts exported from the Northwest Teritories and prices paid to trappers were provided by the Government of the Northwest Territories, Yellowknife. The number of pelts exported from the Yukon Territory and the prices paid to trappers were provided by the Yukon Territorial Game Branch, Government of the Yukon Territory, Whitehorse.

Plans for 1972

Same as 1971.

CENSUS DIVISION

Responsibilities

The division is responsible for conducting a census of population and agriculture in the north, in accordance with the Statistics Act.

Long-term Plans

It is hoped to extend into the north as far as possible the methods of census-taking used in the rest of Canada.

Review of 1971 Operations

As in other parts of Canada, all of the Yukon and most of the Northwest Territories were organized for enumeration in the 1971 census by the use of commissioners and census representatives. As in previous censuses, a few very remote settlements and individuals were enumerated by the Royal Canadian Mounted Police.

Plans for 1972

An evaluation will be made of the results of the 1971 census in the north and recommendations for improvements studied.

Contact with officials of the Government of the Northwest Territories will be through the field division, the collection arm of Statistics Canada.

EDUCATION DIVISION

Responsibilities

To collect, compile and analyze statistics on students at the elementary and secondary levels of education and in trade and apprenticeship training. Data is collected on age, grade, sex, enrolment, operation and attendance, and pupil withdrawals.

Long-term Plans

To continue as at present.

Review of 1971 Operations

During 1971 the data collection and analysis program continued. As well, a publication, *Education in Canada's Northland*, covering the years between 1960 and 1970 was issued.

GOVERNMENTS DIVISION

Responsibilities

To develop and publish, according to need, complete and integrated statistics on all levels of government in Canada (and on their agencies) as a basis for the study of government and of its financial, economic and social involvement in and effect on, national, provincial, Territorial, regional and local activities.

Long-term Plans

To prepare series on all aspects of federal, Territorial and local government involvement in and effect on the Yukon and the Northwest Territories and their municipalities. More specifically, to include series on Territorial government estimated revenue and expenditure for the publication, *Provincial Government Finance — Revenue and Expenditures (Estimates);* to prepare series on quarterly government revenue and expenditure in the Yukon and Northwest Territories for inclusion in planned quarterly releases for 1972-73; to prepare series on quarterly government assets and liabilities in the Yukon and Northwest Territories for inclusion in planned quarterly releases for 1973-74.

Review of 1971 Operations

The governments division published data on revenue, expenditure, assets and liabilities of the governments of the Yukon and Northwest Territories for the fiscal year ending 31 March 1968. It also published similar information on local government in the two Territories for the fiscal year ending closest to 31 December 1967. The chief of the local government section travelled through the Territories during November to explain to local government officials the new financial reporting system for Canadian municipalities, as outlined in the publication, *A Financial Information System for Municipalities*, Volumes 1 and 2.

Plans for 1972

The division plans to publish data similar to that described above, but for the fiscal year 1968-69 for Territorial government operations, and for the fiscal year ended closest to 31 December 1968 for the operations of local governments in the Territories. The division also plans to issue separate data for employment and payrolls in Territorial government administrations.

HEALTH AND WELFARE DIVISION

Notifiable Diseases

Responsibilities

To collect, each week, reports of new cases of notifiable diseases (certain epidemic and infectious diseases) as recommended by the Dominion Council of Health for the Yukon and Northwest Territories.

Long-term Plans

No significant changes are planned.

Review of 1971 Operations

A weekly summary report on notifiable diseases (*Notifiable Diseases,* Reg.—9007—501) is prepared for distribution to provincial departments of health, to the National Health and Welfare Department and to other agencies. Statistical information related to notifiable diseases is also published annually in the *Annual Report of Notifiable Diseases.* Both the weekly and annual reports include information relating to the Yukon and Northwest Territories. The time required to process this information for the north in 1971 was less than one clerk-week.

Plans for 1972

Activities are expected to be the same as in 1971.

Tuberculosis

Responsibilities

To collect information on notifications of new active and reactivated cases, on outpatient treatment of tuberculosis by drugs and on institutions concerned with the treatment of tuberculosis.

Long-term Plans

No significant changes are planned.

Review of 1971 Operations

In 1971 the notifications of new active and reactivated cases were collected, as were the details of outpatient treatment. The institutional data (admission-separation) were also collected for the Northwest Territories. (There are no tuberculosis hospitals in the Yukon.) This information was published in the report *Tuberculosis Statistics, Volume 1 — Tuberculosis Morbidity and Mortality.* To do the work in 1971 took about two clerk-weeks.

Plans for 1972

Activities in 1972 are expected to be the same as in 1971.

Hospital Morbidity

Responsibilities

To collect information on the admission-separation forms for general and allied special hospital cases of residents in the Yukon and Northwest Territories.

Long-term Plans

When historical work is completed, annual tables will be prepared.

Review of 1971 Operations

The preparation of historical work was completed for the period 1962 to 1968.

Plans for 1972

Data for 1969, 1970 and 1971 will be collected.

Vital Statistics

Responsibilities

Under long-standing arrangements, the vital statistics offices of the two Territories supply Statistics Canada with copies of birth, marriage, still birth and death records filed in their jurisdictions under their vital statistics ordinances. Data from these records are used in compiling the official national vital statistics. In turn, Statistics Canada supplies the Territorial office with detailed annual tabulations of their areas, for purposes of local administration. In addition to total counts for each local area, these tabulations provide detailed information on marriage, fertility and mortality rates for the total population and the principal ethnic groups, which is used in long-term planning of health, social welfare and other services.

Long-term Plans

Forms used for the reporting of births, marriages and deaths will be revised to conform to prototypes recommended by the Vital Statistics Council for Canada. Ordinances will likely be revised also to conform with model legislation recommended by the council. Computerized tabulation in Statistics Canada will result in a speed up of tabulations supplied to the Territorial administrations.

Review of 1971 Operations

Detailed tabulations of births (cross-tabulating ages and other characteristics of the parents and of the event), marriages (by religion, status, etc.) and deaths (by cause, age, sex, and other characteristics) were provided to the northern administrations covering the events occuring in 1969. In 1968 arrangements were made, for the first time, to classify all events by newly organized health districts.

Plans for 1972

No changes are contemplated for 1972.

Institutions

(a) Hospitals

Responsibilities

To collect data on the facilities, services, staffing and finances of Canadian hospitals, mental and tuberculosis institutions, including those in the Yukon and Northwest Territories.

Long-term Plans

To assist in the processing of data, plans are under way to develop a new reporting form for mental institutions to incorporate these into one system along with tuberculosis and other hospitals (general and allied special), which have been computerized since data-year 1961. Plans also call for the collection of financial data from private and federal hospitals to accompany those already collected from the public sector.

Review of 1971 Operations

As of 31 December 1971, there were 42 general and allied hospitals in the Yukon and Northwest Territories. Seven hospitals with a total of 237 beds, were public; one with 13 beds was private; and 34 were federal, with a total of 390 beds.

Annual hospital returns were sent to each of these through the Yukon Territorial hospital insurance services in Whitehorse and

the Department of Indian Affairs and Northern Development in Edmonton. Annual data for the year 1969 were published in a series of 12 annual reports. Quarterly hospital returns were also sent directly to the hospitals and three publications covering the first three quarters of 1971 were published.

During 1971 a new unit system for microbiology replaced the previous bacteriology section in the Canadian schedule of unit values for clinical laboratory procedures. An alphabetic index to this list was also introduced. The new Canadian schedule of unit values for physiotherapy and occupational therapy was completed for inclusion in the 1971 annual and quarterly returns.

Plans for 1972

Continuation of the programs as described, plus the development of a Canadian schedule of unit values for radiology procedures to assist hospitals in uniform data reporting. A new program on special care facilities will be implemented in 1972 under which data for related institutions, such as nursing homes, welfare institutions, etc., will be collected and compiled. The publication *List of Canadian Hospitals and Related Institutions and Facilities* will be computerized. In addition the 1972 quarterly hospital information system will be modified both in input and output to collect additional information and to provide participating hospitals with national comparisons in the individual performance indicators.

(b) Health Manpower

Responsibilities

To collect wage and salary data from employees of health occupational groups biennially, and to collect socio-economic data annually on such groups in the Yukon and Northwest Territories using provincial/national registration forms.

Long-term Plans

Tentative plans call for a series on all health manpower covering significant socio-economic characteristics. Among the occupational groups are: physicians, medical laboratory technologists, radiological technicians, occupational therapists and physiotherapists.

Review of 1971 Operations

Wage and salary data for public health nurses were collected in 1971. The information is expected to be released early in the second quarter of 1972.

Characteristics of registered nurses employed in the Yukon and Northwest Territories were also collected in 1971. This annual survey was completed in January 1972 and results are expected to be published in August 1972.

Plans for 1972

Systems are being developed for surveys of radiological technicians and physiotherapists. Data for the former group will be released late in 1972; for the latter, early in 1973.

Mental Health Section

Responsibilities

The mental health section collects statistical information on residents of the Territories who are patients of psychiatric institutions in the provinces.

Long-term Plans

There are no in-patient psychiatric facilities in the Territories to submit statistical information to the mental health section. There are indications that psychiatric units will soon be established, in which case they will be asked to report.

JUDICIAL DIVISION

Responsibilities

The judicial division is responsible for statistics on law enforcement, the administration of justice and corrections, and the sequential integration of these data to give a full statistical description of dealing with offences, accused persons and offenders. The aim of the division is to indicate the effectiveness of the law enforcement, judicial and rehabilitative processes, and permit the various agencies of the criminal justice system to evaluate their efficiency.

Long-term Plans

A request to help in the development of an integrated records and statistical system for the Northwest Territories was received. A preliminary review of the services and special needs was made in the fall of the year. This project will be developed further in 1972.

Review of 1971 Operations

Various publications of the judicial division contain data about the Yukon and the Northwest Territories.

Statistics of Criminal and Other Offences

Has statistics on persons charged with indictable offences, by sex; persons convicted, by specified age groups and sex; persons convicted under the Narcotic Control Act, by type of offence, and country of birth; and convictions of offences punishable on summary conviction. Three local court clerks provided the figures.

Juvenile Delinquents

Refers to appearances before the courts and results, residence, and characteristics. Information was provided by one local court clerk.

Police Administration Statistics

Contains data on police strength, personnel and transport for the Yukon and Northwest Territories classified by police force. The RCMP air detachment provided the figures.

Crime Statistics Police and Traffic Enforcement Statistics

Provide further data. Information for Yukon and Northwest Territories is indicated by type of force. Offences under the criminal code, and federal and Territorial regulations are broken down by offence reported, unfounded, actual number, cleared, and persons charged. Rates per 100,000 population aged seven years and over, and percentages are shown.

Motor vehicles stolen, persons missing, located and drowned are included in *Crime Statistics*. Traffic accidents, persons killed, injured and property damage are given in *Traffic Enforcement Statistics.*

Correctional Institution Statistics

Shows the percentage of persons in custody for Yukon and Northwest Territories, population movement in and out of RCMP guardrooms, Whitehorse Correctional Institution, Yukon Mobile Institution, Yellowknife Correctional Camp and Fort Smith Training Centre, and the place of sentence of Territorial offenders by penitentiary. Twelve local officers were respondents.

National Parole Board Statistics

Decisions made by National Parole Board, persons released on parole, persons terminating parole, and persons denied parole.

Murder Statistics

Murder incidents and victims in the Territories.

Plans for 1972

The Canadian Criminology and Correction Association has undertaken a correctional study of the Northwest Territories sponsored by the Department of the Solicitor General. Figures in the following categories are provided by the judicial division for the years 1967, 1968, 1969 and 1970 and 1971 to June 30.

Juveniles

- Number of cases brought to attention of police, by place of RCMP detachment and type of delinquency.
- Number of cases seized by the juvenile court, by disposition of cases resulting in probation, committals to Fort Smith training centre and parental or other care.
- Number of cases brought before all Northwest Territories juvenile courts for delinquency hearing, by age, place of origin, racial origin, type of delinquency resulting in probation, fine, committals to Fort Smith Juvenile Training Centre and parental or other care.

Adults

- Number of offences known to police under the criminal code, other statutes and Territorial ordinances.
- Number of offences known to police cleared by charge or otherwise, and not cleared.
- Number of cases brought before all Northwest Territories courts distributed by age, racial origin, place of origin, type of offence. Disposition of above cases: acquittals, dismissals, convictions by fine, probation, suspended sentence and committals to penal institutions; reduced charges resulting in acquittals and convictions by fine, probation, suspended sentence and committals and convictions and dispositions of the latter by fine, probation, suspended sentence, committals to penal institutions.
- Number of adult and juvenile persons charged distributed by sex, place of RCMP detachment and type of offence.

MANUFACTURING AND PRIMARY INDUSTRIES DIVISION

Responsibilities

To collect, compile analyze and publish, within the provisions of the Statistics Act, statistics on manufacturing, mining, logging, fishing and energy for the Northwest Territories and the Yukon Territory.

Long-term Plans

To continue and, where applicable, to intensify the current statistical program, including an attempt to publish more data now held confidential under provisions of the Statistics Act.

Review of 1971 Operations

The division continued its collection and publication of data on mining, energy, manufacturing, fishing and forestry for the Territories.

Industries which the division surveys accounted for 99 per cent of the production value of the goods-producing industries in the Territories, excluding construction for which data are not published. (See *Survey of Production* 1969.)

In mining, by far the largest industrial sector measured by output, regular annual statistics continued to be issued for both the Northwest Territories and the Yukon Territory. In the crude petroleum and natural gas industry, the grouping of data introduced in 1969 separates statistics under the title of "Yukon, Northwest Territories and Arctic Islands" from "off-shore and Hudson Bay". This was continued, as was separation of "Hudson Bay" from "east coast off-shore" and "west coast off-shore". (These are all areas under federal jurisdiction, but the latter two are not in the north.) Monthly and annual data were again published on pipelines for the Yukon Territory.

The monthly electric power statistics, first published for each Territory in 1968, have been continued, in addition to the annual data also issued for each Territory.

The annual census of manufactures has continued to yield publishable totals for both the Northwest Territories and the Yukon Territory, as a result of the policy of seeking authorization from respondents to release certain statistics which would otherwise be confidential.

Annual data on fish landings, gear and number of persons engaged in the primary operations are being published for both the Yukon and the Northwest Territories. In addition, products data are being published annually, and landings data are being published monthly for the Northwest Territories.

In the logging industry, data for the Territories were combined.

Plans for 1972

To continue the present expanded program of publication.

TRANSPORTATION AND PUBLIC UTILITIES DIVISION

Responsibilities

To develop and publish statistical series covering all aspects of rail, water, motor vehicle, and air transport, as well as communications systems and other utilities for the Yukon Territory and the Northwest Territories.

Long-term Plans

There are no significant long-term changes planned in this area.

Review of 1971 Operations

Road Transport

The principal statistics covering aspects of the north are contained in the following publications:

Road and Street Mileage and Expenditure

Motor Vehicle Traffic Accidents

The Motor Vehicle, Part II: Motive Fuel Sales

The Motor Vehicle, Part III: Registrations

The Motor Vehicle, Part IV: Revenues

Moving and Storage Household Goods

Motor Carriers – Freight, Part I

Motor Carriers – Freight, Part II

In the report *Road and Street Mileage and Expenditure* the figures for the Northwest Territories and the Yukon Territory are separate. In, *Motor Vehicle Traffic Accidents*, and *The Motor Vehicle*, Parts II, III, and IV, they are combined. And finally, in, *Moving and Storage Household Goods* and *Motor Carriers – Freight*, Parts I and II, figures for the Yukon Territory are combined with figures for British Columbia.

A survey of inter-city commodity movements by for-hire trucking firms was initiated in 1971. Commodity, origin and destination data for movements to and from the northern territories were collected as part of the overall national sample. The survey will be conducted in 1972 along similar lines, with an expanded sample.

Sources for statistics on road transport are:

Territorial treasurer, Whitehorse, Yukon Territory; the director of northern administration branch, Department of Indian Affairs

and Northern Development; the registrar of motor vehicles, Department of Indian Affairs and Northern Development, Whitehorse, Yukon Territory; and the commissioner of the Northwest Territories, Yellowknife, Northwest Territories.

Rail transport

Statistics covering railway freight traffic in the north are published in the quarterly and annual publications, *Railway Freight Traffic.* Before data was published separately for the White Pass and Yukon Route Railway in the *Railway Transport*, Parts I to VI.

Railways operating in the Yukon Territory and the Northwest Territories are the White Pass and Yukon Route Railway and the Great Slave Lake Railway respectively. The latter is operated by Canadian National Railways. Sources of data are the White Pass and Yukon Route Railway and Canadian National Railways.

Water transport

Principal statistics covering the water transport aspects of the north are contained in:

Shipping Report, Part II: Coastwise Shipping; Shipping Report, Part IV: Origin and Destination for Selected Ports; Shipping Report, Part V: Origin and Destination for Selected Commodities.

These reports have complete statistics for Churchill, Manitoba, plus all Northwest Territories, northern Ontario and northern Quebec ports that trade with eastern Canada. Data lacking at this time include Northwest Territories statistics for the Mackenzie River and for the occasional movements between places in the north by vessels smaller then the required reporting size. The published statistics do not include operations of government vessels.

In 1970 there were four companies in the Northwest Territories which submitted data for *Water Transportation,* Northern Transportation Co. Ltd., Kaps Transport Ltd., Cooper Barging Ltd. and Lindberg Transport Ltd.

Air transport

Principal statistics covering air transport in the north are given in the following reports:

Aircraft Movement Statistics, Air Passenger Origin and Destination Statistics, Domestic Report, and *Air Passenger Origin and Destination Statistics, Canada-United States Report,*

Aircraft Movement Statitics, is prepared for the Ministry of Transport and provides data on aircraft take-offs and landings at individual airports. The statistics are collected from daily reports prepared by air traffic controllers or airport managers. The survey includes six airports in the Yukon Territory and 15 in the Northwest Territories.

Air Passenger Origin and Destination Statistics, provides data on air passenger traffic, on Class 1 and major Class 2 unit toll services, showing specific points of origin and destination in the north. Data is collected from a sample of lifted flight coupons reported by Air Canada, CP Air, Eastern Provincial Airways, Pacific Western Airlines, Quebecair, Transair and Nordair. Origin-destination statistics are filed under authority of the Aeronautics Act and administered by the air transport committee of the Canadian Transport Commission.

Public utilities: communications

Statistics covering communications in the north are given in the publications *Telegraph and Cable Statistics,* and *Telephone Statistics.*

In some of the tables, the figures for the two Territories are combined; in others, they are separate. Occasionally, figures are included with those for British Columbia. Sources of statistics for telegraph, cable and telephone statistics are the Department of Transport, Canadian National Telecommunications and Bell Canada.

Plans for 1972

A review is currently under way in the transportation and public utilities division, to modernize and update all surveys in road, rail and water transport. Review teams will consider the provision of additional information on transportation in the north and, in particular, the addition of separate items for the Yukon and Northwest Territories in the publications of the division.

Any changes will be implemented later in 1972 or early 1973.

UNEMPLOYMENT INSURANCE COMMISSION

Responsibilities

To administer the Unemployment Insurance Act, and to provide benefits to workers in the area under the provisions of the Unemployment Insurance Act. The district office in Prince George, B.C. serves the Yukon Territory; the district office in Edmonton, Alberta serves the districts of Mackenzie and Franklin, except Baffin Island in the Northwest Territories. The district offices in Winnipeg, Manitoba and Montreal, Quebec, serve the districts of Keewatin and Baffin Island respectively.

Long-term Plans

To increase contact with territorial government and settlement agents in order to raise the standard of service in the area.

Review of 1971 Operations

The Canadian public usually deals with the commission by mail. The commission operates district offices only in larger centres, but employees travel throughout the area to conduct audits and interviews to ensure adherence to the Act.

Unemployment insurance services were provided in the Yukon and Northwest Territories through the offices noted above. Agents have been appointed to assist the people in completing their application for benefits forms. The commission also has agents at Hay River and Yellowknife.

Services in the Yukon have been extended by the establishment of a full-time enquiry office in Whitehorse. Arrangements are being made to appoint an officer of the commission in Yellowknife to handle operations in the District of Mackenzie.

Discussions were held with Territorial authorities, and it was decided that due to the small number of claims there was no need for permanent agents of the commission in the Territories, as the settlement managers in the District of Keewatin could handle them.

Publicity

In April 1971 the commission ran a publicity campaign in northern communities employing three NWT radio stations and five weekly newspapers. Its purpose was to tell northern residents where to obtain claimant's kits and to provide further information on the new unemployment insurance program.

Plans for 1972

A guide, *Completing Applications for Unemployment Insurance Benefit* is being prepared in the Winnipeg office for distribution to the settlement managers.

The commission will provide assistance for the interpreter for the Northwest Territories to translate the employer's booklet and the claimant's booklet into the Eskimo dialect. Also, teams will be organized to visit the various cities and settlements to lead discussions concerning the new unemployment insurance legislation, and provide information to northerners.

APPENDIX A

Population — Settlements in Northwest Territories

Source: Statistics Canada

Preliminary counts of the 1971 Census with corresponding 1966 population figures.

Settlement	1966	1971
Yellowknife *	3,741	5,867
Inuvik	2,040	2,672
Hay River	2,002	2,420
Fort Smith	2,120	2,372
Frobisher Bay	1,631	2,014
Pine Point	459	1,225
Rae	779	1,056
Baker Lake	596	756
Fort Simpson	712	747
Cambridge Bay	511	716
Pangnirtung	376	690
Fort McPherson	654	679
Aklavik	611	677
Coppermine	536	637
Fort Resolution	677	623
Eskimo Point	464	598
Cape Dorset	357	597
Tuktoyaktuk	512	596
Fort Providence	378	566
Rankin Inlet	429	566
Igloolik	328	563
Pond Inlet	178	416
Coral Harbour	298	355
Fort Franklin	311	339
Broughton Island	201	334
Fort Good Hope	335	327
Norman Wells	199	301
Gjoa Haven	162	276
Clyde River	99	274
Arctic Bay	123	269
Hall Beach	100	263
Fort Liard	177	263
Chesterfield Inlet	199	258
Fort Norman	216	248
Repulse Bay	146	242
Holman Island	179	241
Belcher Islands	178	234
Snowdrift	176	221
Pelly Bay	171	215
Whale Cove	181	213
Spence Bay	247	209
Lake Harbour	97	189
Resolute Bay	254	184
Lac La Martre	125	161
Wrigley	136	152
Sachs Harbour	132	143
Tungsten	198	130
Grise Fiord	198	109
Arctic Red River	86	108
Port Burwell	105	107
Port Radium	1	99
Paulatuk	40	95
Reindeer Station	76	—
Rae Lake	53	73
Nahanni Butte	71	66
Colville Lake	67	65
Daly Bay	59	—
Enterprise	25	56
Trout Lake	30	48
Jean Marie River	51	47
Kakisa Lake	39	42
Kipisa	38	33
Marian Lake Village	43	29
Camsell	—	25
Edzo	—	25
Dory Point	—	17
Marian Lake Camp	—	16
Camp Kyukjuak	—	15
Pattinson Harbour	13	—
Cape Parry	50	12
Eureka	13	10
Paradise Gardens	—	10
Snare Lake	56	9
Aslon Bay	—	8
Resolution Island	18	8
Mould Bay	56	6
Hislop Lake	25	4
Rocher River	38	4
Twin Gorges	—	5
Buffalo River Junction	—	3
Nicholson Point	22	3
Salt River	7	2
Isachsen	12	2
Bell Rock	—	1
Other	2,815	530
Total	28,738	34,807

Population — Settlements in Yukon Territory

Source: Statistics Canada
Preliminary counts of the 1971 Census with corresponding 1966 population figures.

Settlement	1966	1971
Whitehorse*	4,771	11,084
Faro	—	850
Dawson	742	745
Watson Lake	554	553
Mayo	479	462
Clinton Creek	—	381
Carmacks	311	348
Teslin	324	340
Ross River	173	317
Elsa	529	298
Upper Liard	148	219
Old Crow	218	206
Carcross	199	188
Haines Junction	195	179
Pelly Crossing	137	141
Beaver Creek	114	120
Watson Lake Airport	77	89
Destruction Bay	64	82
Keno Hill	144	79
Flat Creek	1	71
Burwash Landing	69	67
Stewart Crossing	28	43
Quill Creek	2	35
Swift River	40	33
Mile 904, Alaska Hway	—	29
Mile 837, Alaska Hway	—	24
Mile 5, Klondike Hway	—	21
Mile 1035, Alaska Hway	—	20
Iron Creek	28	19
Tuchitua Lake	—	17
Mile 850, Alaska Hway	—	17
Windid Lake	—	16
Millerville	18	16
Mile 1169, Alaska Hway	8	15
Mile 687, Alaska Hway	6	14
Mile 866, Alaska Hway	6	14
Mile 2, Klondike Hway	—	13
Mile 974, Alaska Hway	—	13
Dominion Creek	5	12
Eagle River	—	12
McCabe Creek	—	12
Mile 3, Klondike Hway	—	12
Mile 1019, Alaska Hway	21	12
Donjek	13	11
Cowley	11	11
Other	4,870	1,128
	14,382	18,388

APPENDIX B

SUMMARY OF NORTHERN SCIENTIFIC EFFORT

1971-72

CLASSIFICATION	FUNDS $	MANPOWER						
		Government			Non-Government			
		Scientific	Other	Man-years	Scientific	Other	Man-years	Total Man-years
Biological Sciences	3,207,053	82	142	175.85	22	12	18.95	194.80
Earth and Physical Sciences	11,983,500	273	237	330.84	22	90	84.45	418.29
Engineering	2,717,900	36	106	78.2	10	15	12.00	90.20
Health Sciences	95,000	2	0	2	14	0	2.5	4.50
Social Sciences	449,300	34	15	34.9	22	22	3.7	38.60
Multi-disciplinary Scientific Activities	5,241,610	135	127	184.4	52	51	43.5	227.90
TOTAL	23,694,363	562	627	806.19	142	190	168.1	974.29

BIOLOGICAL SCIENCES

The total Federal Government expenditure for directed scientific activities in the Biological Sciences in Northern Canada for the fiscal year is planned to be:

Funds – $3,207,053

Manpower	Government	Non-Government
Scientific	82	22
Other	142	12
Man-years	175.85	18.95

The largest single program "Agricultural Research – Northern Group" sponsored by the Department of Agriculture accounts for $1,099,000 or about one-third of the total expenditure planned for the year. Wildlife and wildlife habitat programs account for about $933,000, and about $841,000 have been allotted for fish and marine life studies. A vegetation study associated with the Mackenzie Valley studies but not part of the Department of Agriculture program accounts for $226,000.

Brief resumés of individual programs are contained in the following pages.

*Department of Fisheries and Forestry should now read Department of the Environment.

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Chemistry	Study Properties of Arctic Petroleum, Gas and Coal	Evaluate quality of fossil fuels in relation to their economic potential and pollution characteristics.	Part of Mineral and Energy Resources Program MERP	E.M.R./ Mines Br.	DIAND EMR/GSC	20,000	2	1			3	Continuing		
Plant and Animal Ecology Animal Behaviour	Studies in Degradation of Wildlife Habitat as a Consequence of Industrial Development	Determine the effects of industrial activity on wildlife and wildlife habitat	Provision of advice to Land-Use Inspectorate and NWT Water Board: Setting stipulations for exploration parties	Dept. Fish.-Forestry CWS-Western Region	DIAND	493,295	8	4			12	1970	Continuing as necessary	Supplements studies of western Arctic caribou and provides technical advice on N.W.T. programs to government agencies
Ecology Population Dynamics	Studies of Ecology of the Arctic Fox	Elucidate the determinants of Arctic fox harvest size	NWT Game Management Program	Dept. Fish.-Forestry CWS-Western Region	NWT Govt. University of Sask. (Contract)	5,650			1		1	1966	1971	
Ecology Population Dynamics	Population Dynamics of Western Arctic Migratory Birds	Describe the range and varieties in population structure of selected species of Arctic nesting waterfowl	CWS-Migratory Bird Program	Dept. Fish-Forestry CWS-Western Region		28,335	1	1			1.5	1967	1972	
Entomology	Entomological Research	Behaviour of insects in the northern environment		DND/DRB	Canadian Armed Forces	17,000			3		3	1971	1972	Grants to universities of Manitoba and Alberta for field and lab. research
Wildlife Management	Surveys of Waterfowl Populations and Habitat, Western Arctic	Determine patterns of waterfowl migrations and habitat use in respect to oil transport routes; to determine variations from normal in reproduction of important species	Component of Migratory Bird Surveys Program	Dept. Fish-Forestry	CWS-Western Region	26,598	1				1	1971	1973	
Animal Ecology	Studies of Western Arctic Caribou	Identify areas of habitat critical to maintenance of existing populations of caribou	Follow-up to 1970-71 program to delimit critical areas for the maintenance of wildlife populations of social value	Dept. Fish-Forestry CWS-Western	DIAND	20,233	1	1	1		0.7	1971	1975	DIAND provides financial support

BIOLOGICAL SCIENCES

Annex B

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Animal Ecology Wildlife Management	Studies of Dall sheep in Richardson Mts.	Determine areas critical to maintenance of Dall sheep populations	NWT Game Management Program: Advice on Land-Use Regulations	Dept. Fish-Forestry	DIAND NWT Govt. CWS-Western Region	15,855		1			0.5	1971	1972	DIAND provides financial support
Ecology Wildlife Management	Technical Advice to Governmental Agencies in NWT	Determine implication of resource development and maintenance of biotic resource values in NWT; provide short term data collection and research	Environmental input to resources development planning and game management	Dept. Fish-Forestry CWS-Western region	NWT Govt. DIAND	42,000	1	1			1.8	1971	Continuing	
Ecology Histology Physiology	Reindeer Herd Studies	To obtain histological reproductive data on known-age reindeer for comparison with reproduction data on Keewatin caribou, to check and refine caribou data	An extension of the 4-year caribou project of CWS	Dept. Fish-Forestry CWS-Eastern Region		28,254	1				1	1971	1973-4	
Ecology Physiology	Polar Bear Research	Obtain biological data for the protection of the species and for management of species as a game animal	Program coordinated with work of IUCN Polar Bear Group, Provinces and Territories	Dept. Fish-Forestry CWS-Eastern Region	IUCN Polar Bear Group, Provincial Polar Bear Technical Committee, National Geographic Society, U. of Alta. U. of Montana, U.S. Sport Fisheries & Wildlife	119,645	3	1	2		3.5 1.2	1967	1974	National Geographic Society provided $2,500 A monitoring program will continue indefinitely to determine productivity and polar bear — seat sea ice relationships and behaviour
Ecology Range Management Animal Behaviour	Muskox Peary Caribou and Arctic Wolf Research	Obtain quantitative data on these species to ensure their protection from extinction as Arctic development increases — provide game management recommendations	Arctic Environmental Studies concerned with specific biological problems of major land species	Dept. Fish-Forestry	NWT Game Management Service U. of Alberta AINA	6,450	1	2			2	1969	Not yet determined	

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Genetics Animal Behaviour Ecology	Migratory Bird Research — Eastern Arctic Project 4515-04 (contract)	Evolutionary implications of assortative mating patterns of colour phases of snow geese	Part of CWS Eastern Region Migratory Birds Research Program	Dept. Fish-Forestry CWS-Eastern Region	Queens's University (contract), Cdn. National Sportsman's Show, Cdn. Industries Ltd.	6,000			3	3	2	1968	1972	
Ecology Ornithology Animal Behaviour	Migratory Bird Research, Eastern Arctic Project 4515-04 (contract)	Factors affecting productivity of nesting snow geese and Canada geese related to management program of CWS	Part of CWS Eastern Region Migratory Birds Research Program	Dept. Fish-Forestry CWS-Eastern Region	U. of Western Ontario, NRC, Cdn. National Sportsman's Show, Wildlife Management Institute	12,600			3	3	4	1964	1971	Phase 1 completed 1971. Phase 2, if approved will run to 1974-75 Total cost to CWS $80,000
Ecology Ornithology	Seabird Survey Project 4509	Quantitative information on distribution of birds at sea in Arctic and NW Atlantic	Part of CWS-Eastern Region Migratory Bird Research Program	Dept. Fish-Forestry CWS-Eastern Region	University of Moncton (contract)	19,500	2	1	2	2	1.5 3	1968	1973	Dept. of Transport and E.M.R. provide space on vessels using relevant sea routes; DND provides space on aircraft. Total cost $50,000
Ecology Range Management	Caribou Research (Arctic Islands)	To obtain data on caribou range conditions on Southampton I.; To obtain comparative data from heavily used Coats I. range	An extension of the 4-year caribou project of the CWS	Dept. Fish-Forestry CWS-Eastern Region		52,804	2	1			1.6	1970	1973	
Ecology Range Management	Caribou Range Management	To obtain data on Keewatin caribou population; collect similar data on Bathurst Inlet caribou for comparison; develop range and game management plans for both herds	An extension of the 4-year caribou project of CWS	Dept. Fish-Forestry CWS-Eastern Region	University of Idaho	24,300	10	1			1.2	1971	1974	
Ecology	Caribou Calving Ground Studies	Obtain data on caribou calf mortality during post-calving period	An extension of the 4-year caribou project of CWS	Dept. Fish-Forestry CWS-Eastern Region		20,709	1				1	1970	1973	

BIOLOGICAL SCIENCES

Annex B

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Fish Population Dynamics	Collection of Data by Conservation and Protection Officers	Collect data on mortality of fish angled and released and seismic survey effects, etc. as directed by FRB scientists	Part of overall scientific program of FRB and Fisheries Service in northern Canada	Dept. Fish-Forestry Fisheries Service	Territorial Governments	100,000		6			6		Continu-	
Forest Entomology Pathology	Forest Insect and Disease Survey	To survey and report on the location and severity of actual or potential forest insect and disease outbreaks in NWT	Insect and disease surveys conducted in all parts of of Canada	Dept. Fish-Forestry Forestry Service		1,000	1	1			0.2	Continuing		
Ecology — plant — animal	Arctic Ecology Program	Monitor environmental quality and events north of Lat. 60°		Dept. Fish-Forestry CWS-Eastern Region	DIAND	25,000	2				2	1971	1971	A survey project
Ecology Ornithology	Migratory Bird Research, Eastern Arctic — Project 4515	Study of distribution and population change of greater snow geese and other geese in Arctic	Part of CWS Eastern Region Migratory Birds Research Program	Dept. Fish-Forestry CWS-Eastern Region	Quebec Wildlife Service U.S. Wildlife Management Institute	3,000	1		2	1	0.4 2	1969	1972	Total cost of program to CWS $10,000 Additional $80,000 provided by affiliated agencies
Ecology Population Dynamics	Population Assessment and Life History of Marine Fishes FRB 8970	To determine standing stock of marine fishes in selected areas — for assessment of commercial possibilities and for an understanding of Arctic water productivity	Part of FRB Arctic Biological Station Arctic Marine Productivity Studies	Dept. Fish-Forestry FRB	Terr. Govt. National Museums	51,000	1	5			4	1947	Continu-ing	
Ecology and Population Dynamics	Population Dynamics of Freshwater Fish in Arctic and Sub-Arctic FRB 9083	Define: Environmental conditions influencing fish production; Dynamics of natural population requirements for aquaculture development	Part of investigation of freshwater fisheries management and aquaculture study in central and northern Canada	Dept. Fish-Forestry FRB/Freshwater Inst.	Territorial Governments	47,000	1	1			2	1944	Continu-ing	

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Limnology	Freshwater Ecological Surveys FRB 90-	Provide baseline information on biota of freshwater ecosystems in the north	Part of widespread Freshwater Environmental	Dept. Fish-Forestry FRB/Freshwater Inst.	Territorial Governments DIAND CWS	376,000	7	28			25	1970	Continuing	
Mammalogy Taxonomy Biogeography	Collection of Small Mammals West coast of Alaska	To collect specimens of several species of small mammals	Ground work for future studies of Canadian Arctic mammals	Sec. State, Nat. Museums, Museum of Natural Sciences	U.S. Fish and Wildlife Service	5,000	1	1			.5	1971	1971	Logistic support provided by U.S. Fish and Wildlife Service
Systematics and Ecology	Marine Zooplankton of Canadian Arctic Waters	Survey of animal species of marine plankton community		Sec. of State, National Museums, Museum of Natural Sciences	Bedford Institute	11,000	3				1	1971	1972	Logistic support provided by Polar Continental Shelf Project
Ecology and Population Dynamics	Biology and Population Dynamics of Arctic Marine Mammals FRB 895-	To determine maximum sustainable yield of those marine mammals that have an existing or potential domestic, commercial or recreational value	Part of FRB Arctic Biological Station Marine Mammal Studies	Dept. Fish-Forestry FRB	Terr. Gov't DIAND	34,000	1	6			2.5	1960	Continuing	
Oceanography Ecology	Biological Oceanography Base-line Ecology and Arctic Environment FRB 896-	To determine fundamental relationships between marine organisms and provide base-line information on which to determine effects of industrial development	Part of FRB Arctic Biological Station Marine Environmental Studies	Dept. Fish. Forestry FRB		210,000	5	9			11.5	1966	Continuing	Outgrowth of FRB Biological oceanography studies started in 1948 in Hudson and Ungava bays
Ecology Land Classification	Terrain Sensitivity Survey	To map and classify vegetation in relation to land form and terrain sensitivity in the Mackenzie Valley Pipeline Corridor	Part of a collaborative effort to classify terrain sensitivity as a guide to land use regulations	Dept. Fish-Forestry Forestry Service	DIAND EMR/GSC	226,000	6	3			7.1	1971	Continuing	A capital expenditure of $42,000 is included

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Plant Science Genetics Soil Science Agrometeorology Plant Pathology	Agricultural Research — Northern Group	Consider the arable lands north of 55°, to determine the responses of plants to the environment, to develop crop plants suitable to the environment	Part of the Dept. of Agr. Research Program	Dept. of Agriculture		1,099,000	13	64			77		Continuing	Expenditure incl. $55,000 for capital outlay
Entomology	Biting Fly Ecology and Control	To develop a practical integrated control of black flies	Part of Beef Cattle Production Program	Dept. of Agriculture	Alta. Dept. of Agriculture U. of Alta.	40,000	1	1	2	2	2.0 1.5	1969	1974	
Ichthyology Taxonomy Zoogeography	Taxonomic and Distributional Study of Marine Fishes of Arctic Canada	Publication of book — Fishes of the Arctic Coast of Canada	Study of all animals and plants of Canada	Sec. of State, National Museums, Museum of Natural Sciences	Dept. of Fish-Forest FRB	12,000	1	1			1	1965	1975	No field work during 1971-72
Ethology Ornithology Mammalogy Ecology Entomology Botany	Bathurst Island Project	Study life history of Arctic animals, interrelationships between animal populations, effect of weather on animal populations		Sec. of State, National Museum, Museum of Natural Sciences		4,525	3		4		0.85 1.0	1968	1977	Logistic support provided by Polar Continental Shelf Project
Ornithology Ecology	Ornithological Field Studies of Interior Areas East of James and Hudson Bays	Obtain distribution and ecological data and specimens	Part of long-range study of birds of boreal forest and adjacent Arctic areas	Sec. of State, National Museum, Museum of Natural Sciences		3,300	1	1		1	0.5 0.25	1971	1971	

Annex C

EARTH AND PHYSICAL SCIENCES

The total Federal Government expenditure for directed scientific activities in the Earth and Physical Sciences in Northern Canada for the fiscal year 1971-72 is planned to be:

Funds – $11,983,500

Manpower	Government	Non-Government
Scientific	273	22
Other	237	90
Man-years	330.84	87.45

Geological programs (including marine geology and closely related disciplines) account for about $3.8 million of the total planned expenditure for directed scientific activities in the Earth and Physical Sciences. Hydrographic and Oceanographic programs and studies account for about $3.4 million, and space and ionospheric research for about $2.2 million. Approximately $573,000 has been earmarked for sea ice, iceberg, and glaciological studies, about $300,000 of this amount is in support of sea ice programs. Approximately $1.4 million is programmed to support activities in Geomagnetism (596,000), Gravimetry $447,000) and Seismology ($393,000). Canada contributes to international programs in each of these three fields and funds for these programs account for the major portion of the total allotment.

Brief resumés of scientific activities in the Earth and Physical Sciences are contained in the following pages.

EARTH AND PHYSICAL SCIENCES

Annex C

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Geomagnetism	Study Anomalous Magnetic Features in Earth Crust	Investigate nature and causes of local magnetic anomalies in Northern Ellesmere Island		EMR/Earth Physics Branch	P.C.S.P.	50,000	2	1			1	1961	1973	
Geomagnetism	High Level Aeromagnetic Surveys of Archipelago and Arctic Ocean	To obtain basic information on earth's magnetic field	Part of Magnetic Survey of Canada	EMR/Earth Physics Branch		43,000	3	1			3	Continuing		
Geomagnetism	Paleomagnetic Studies	Determine variations of Magnetic field in geological past	Part of general study of the paleomagnetism of the sedimentary basins of Western Cdn. Shield	EMR/Earth Physics Branch	Geological Survey P.C.S.P.	74,000	6	3			4	1969	1974	Includes 2 programs — Great Bear Lake — Victoria Is.
Geomagnetism	Aeromagnetic Survey Davis Strait-Baffin Bay	Map magnetic anomalies	Supplement surveys carried out 1964, 1966, 1967 at request EMR	NRC/NAE E.M.R.		70,000	2	10			2.5	1971	1971	
Geomagnetism	Arctic Geomagnetic Observatories	To obtain continuous recordings of variations of earth's magnetic field	Part of Canadian and international network of magnetic observatories	EMR/Earth Physics Branch	NRC F. F. CMS	350,000	2	9		2	8 1	1951	Continuing	
Geomagnetism	Secular Variation of Magnetic Field in Arctic	Determine long term changes in magnetic field	Part of Canadian Magnetic Survey Program	EMR/Earth Physics Branch		19,000	1	2			0.5	Continuing		
Gravimetry	Studies of Regional Gravity in Arctic Canada	To map variations in gravity and establish the absolute gravity of selected sites	Part of 1st Order World Gravity Network and Gravity Survey of Canada	EMR/Earth Physics Branch	EMR/PCSP F.F./Marine Science Br. F.F. Cdn. Met. Service	447,000	8	10		13	5 5	Continuing		Includes 6 programs — Regional Gravity Surv. 02-71-104(1) 02-71-104(2) 02-71-104(3) 02-71-107 — Gravity Control Survey 02-71-104(4) 02-71-104(5)

EARTH AND PHYSICAL SCIENCES

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Seismology	Earthquake Seismology	Monitor earthquake activity in Arctic Canada and to identify underground nuclear explosions; also to assess potential earthquake damage	Part of Canadian and world-wide network of monitoring earthquakes and nuclear explosions	EMR/Earth Physics Branch		361,000	7	11			16	1950	Continuing	– Included are 3 programs – Operation seismic observatories – seismic risks – preparation and development of seismic array at Yellowknife
										1	1			
Seismology	Explosion Seismology	To investigate earth's crust under Canadian Shield by means of crustal seismic reflection-refraction method		EMR/Earth Physics Branch		32,000	5	1			2	1969	1972	
Geodesy	Horizontal and Vertical Control in Yukon & NWT	To provide vertical and horizontal control for mapping and scientific studies	Part of Earth Sciences Program	EMR/Surveys and Mapping Branch		140,000	5				5	Continuing		Program could be completed in 4 yrs if expenditures were increased to $580,000 and 17 man-years per year
										11	5			
Cartography, photo-grammetry	Photo Maps, Mackenzie Valley	To obtain air photography and APR altitudinal control for updating topographic maps and preparing photomaps for sections of the Mackenzie Valley pipeline area	Part of Earth Sciences Program	EMR., Surveys & Mapping Branch		325,000			Not available			1971	1972	Total activity by contract
Geology	Mineral Deposits Reference Data MERP 3	To provide reference data on mineral deposits and geology in Arctic	Part of National Mineral and Energy Resource Program (MERP)	EMR/GSC		100,000	4	1			5	Continuing		Includes 10 separate projects, 6 with field components
Geology Geochemistry Geophysics	Research into techniques for Discovering Mineral Deposits MERP 4	Develop or improve methods for discovering mineral deposits in Arctic	Part of National Mineral and Energy Resources Program MERP	EMR/GSC		422,000	9	3			12	Continuing		Includes 8 projects – all have field components

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Quaternary Geology, Geomorphology	Quaternary Geology ESP-E.1	Understand and describe terrain and geological features of Arctic	Part of Earth Sciences Program	EMR/GSC	DIAND	349,000 *Plus funds from ALUR program	12	2			14	Continuing		Includes 15 projects — 8 with field components
Engineering Geology, Terrain Assessment	Study of geological and terrain factors relating to man's activities in the Arctic	To determine the performance and sensitivity of the Arctic terrain; to provide information on the effect of man's activities on the terrain and vice versa	Part of Earth Sciences Program	EMR/GSC	DIAND	370,000 *Plus funds from ALUR	7	3			12	12	Continuing	Includes 5 projects — 4 have field components
Geology Geophysics	National Geoscience Mapping Service MERP 1-1	To describe geology and mineral occurrences of Arctic Canada	Part of National program to describe the geology of Canada	EMR/GSC		1,261,000	23	4			27	Continuing		Includes 36 separate projects — 19 have field components
Geology Metallogeny	Study of Formation of Mineral Deposits MERP 1-2	To determine potential for economic development of mineral deposits in various regions of Arctic	Part of National Mineral Resources Program (MERP)	EMR/GSC		253,000	11	1			12	Continuing		Includes 16 separate projects — 9 have field components
Geology Geophysics	Analysis of Regional Mineral Potential MERP 2	To determine potential of economic mineral deposits in Arctic	Part of National Mineral and Energy Resources Program MERP	EMR/GSC		632,000	26	2			28	Continuing		Includes 33 projects — 17 have field components
Mineralogy	Survey of Non-Metallic Minerals for Local Arts & Crafts Industry	To locate sources of gem quality rocks and carvable rock on Baffin Island		EMR/Mines Branch	DIAND	1,000	1				0.04	1970	Continuing	
Mineralogy	Mineral Beneficiation process	To develop methods of separating the minerals in tungsten ore in N.W.T.		EMR/Mines Branch		15,000	1	1			0.5	1970	Continuing	
Earth Physics	Geothermal Heat Flow in Arctic	To measure flow of heat from interior of earth and study distribution and changes in permafrost	Part of National Program of Heat Flow measurements	EMR/Earth Physics Branch	EMR/PCSP DIAND	42,000	4	2			1.5	1964	Continuing	Includes 2 programs — measurement of heat flow from Arctic Ocean and Lakes. — measurement of heat flow from mining and petroleum drill holes

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Marine Geophysics	Geophysical Studies of Baffin Bay	Studies of earth crust in Baffin Bay	Part of Geophysical Study of North Atlantic Basin	EMR/ Bedford Institute	Dept. Fish.-Forestry Dalhousie University	120,000	6	10	2		5 0.7	1963	1974	Cost of ship not included
Marine Geology Sedimentology Physiography Geochemistry Paleontology	Study of Physiography, sediments and bottom fauna of marine areas of Arctic Canada	To study: 1. Bottom sediments-Baffin Bay Archipelago Beaufort Sea of Arctic 2. Organic chemistry of Arctic marine sediments. 3. Bottom dwelling organisms in sediments of Arctic waters. 4. Ecology of plankton of Arctic waters. 5. Geophysics of continental margin of Arctic Canada		EMR/ Bedford Institute	Dept. Fish.-Forestry Atlantic Oceanographic Lab. GSC	292,600	10	5			15	1960	1976	Includes 10 programs
Glaciology Earth Physics	Measurements of Thermal Conductivity of Glacial Ice	To understand heat regime of glaciers		EMR/Earth Physics Branch and PCSP		6,000	1	1			0.5	1971	1972	
Meteorology Glaciology Oceanography	Compilation of Iceberg Information-Labrador Shelf	Obtain background data on icebergs in order to assess the adequacy of precautions and practices for off-shore development		EMR/ Resource Management and Conservation Branch		2,000		1			0.4	1970	–	
Glaciology Oceanography	Study of Production of Icebergs in Arctic Canada G70-2	Identify iceberg producing glaciers and survey rate and volume of iceberg production	Related to Ice-Reconnaissance Program of Cdn. Meteorological Service	Dept. Fish.-Forestry Inland Waters Branch	EMR/PCSP	40,000	3	6			1.5	1970	1974	
Glaciology Meteorology Ice Physics Hydrology	Mass Balance and Movement of Arctic Glaciers	Study behaviour of Arctic glaciers	National Waters Resources Study	Dept. Fish.-Forestry Inland Waters Branch	EMR/Surveys & Mapping PCSP DND/DRB	78,000	4	13			5	1964	1976	Includes 3 programs – Barnes Ice-cap G67-11 Decade Glacier G67-13 Per Ardua Glacier G67-14

EARTH AND PHYSICAL SCIENCES

Annex C

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Glaciology Cargography	Collection of Information on Perennial Ice	Assemble and make available information about perennial ice and snow of Arctic Canada	National Water Resources Study Part of Cdn. Program for International Hydrological Decade (IHD)	Dept. Fish.-Forestry Inland Waters Branch		33,000	6	22			5.5	1965	Continuing	Includes 3 programs — Glacier Inventory G67-15 Atlas — G69-1 Archives G-69-2
Glaciology Photogrammetry	Measurement of Ice Ablation G67-16	Test photogrammetric methods of measuring ice ablation	National Water Resources Program	Dept. Fish.-Forestry Inland Waters Branch	EMR/PCSP McGill University	22,000	1	1			1.5	1967	1972	
Ice Physics	Icecap Drilling Program	Study of climatic history of region, study physical properties of large icecap		EMR/PCSP		62,000	2	4		3	3 2	1971	1972	Lead program for an International Polar Program using icecaps to study climate
Ice Mechanics	Sea Ice Dynamics	Study deformation of land fast ice in Beaufort Sea	Part of continuing sea ice studies by EMR and MOT	EMR/PCSP	MOT	10,000			1	1	2	Continuing		
Glaciology Oceanography	Sea Ice Reconnaissance	Repeated systematic surveys of sea ice in Canadian Archipelago and Arctic Ocean to prepare and up-date the Ice Atlas to Arctic Canada	Part of continuing sea ice studies by EMR and MOT	EMR/PCSP	Cdn. Met. Service MOT	130,000		1	1	2	1 2	Continuing		
Geophysics	Ice Research	Study of physical properties of ice — study movement and change of sea ice		DND/DRB	Universities	38,000			6		6	Continuing		Grants to universities
Climatology	Ice Atlas Eastern Canadian Seaboard and Hudson Bay	Preparation of ice data for publication in Ice Atlas	Publication of Ice Atlas of Canadian Arctic	F. & F./Met. Service	MOT	28,000	1	1			1.4	1969	1973	Total cost $48,000
Geophysics	ACN 29 Geophysical Studies	Study: Characteristics of sea ice and icebergs. Evaluation of terrain and vehicle mobility. Surveillance of the ground by remote sensing		DND/DRB	MOT EMR Universities Cdn. Armed Forces	440,000	9	3			12	Continuing		

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Meteorology Glaciology	Climatology of Arctic Icecaps	To study relationship between weather and characteristics of icecaps	National Water Resources Study	Dept. Fish. Forestry Inland Waters Branch	EMR/Geological Surv. PCSP Met. Service AECL AINI	28,000	2	2		3	2 1	1961	1975	Includes 2 programs — Baffin Is. G67-12 Devon Is. G69-4
Glaciology Chemical Engineering Oceanography	Oil Pollution in Ice Infested Waters G70-3	To study behaviour of oil spills in sea ice		Dept. Fish.-Forestry Inland Waters Branch	EMR/PCSP US Coast Guard	40,000	2	2			2	1970	Continuing	
Oceanography Meteorology	Determination of Wind Stress over sea Ice	To determine wind turbulence and velocity profile and heat exchange over Beaufort Sea	Part of AIDJEX Program	EMR/Bedford Institute	Dept. Fish.-Forestry Atlantic Oceanographic Lab. PCSP	16,000	1		1		0.5 0.5	1969	Continuing	Cost does not include field support by PCSP
Climatology Oceanography	Data Acquisition	Acquire data to support research activities of Met. Service or on behalf of other services	Part of a Canada-wide program of similar nature	Dept. Fish.-& Forestry/ Met. Service	EMR NH&W NRC	No additional cost						continuing		Observation programs include ice thickness, freeze break-up, noctilucent cloud, radiation, radioactive sample seismological snow survey, Soil temp., sunshine, visual aurora ozone
Climatology	Climatological Information for Site Selection of Airports	Provide climatological data for selected locations	DIAND Airport Expansion Program in Northern Canada	Dept. Fish.-& Forestry/ Met. Service	DIAND MOT	9,700	1	1			0.7	1968	1973	Estimated total expenditure $25,800
Climatology	Reconstruction of Climatological Records	Computation of normals for all Arctic WX stations	Computation of 3-years normal for all Canadian Climate Stations	Dept. Fish.-& Forestry/ Met. Service		8,200	1	1			0.7	1969	1972	Total Expenditure $14,000

EARTH AND PHYSICAL SCIENCES

Annex C

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Climatology	Airport Climatology Arctic Manual	To prepare climatic details for all northern airports and potential airport sites		Dept. of Fish. and Forestry/ Met. Service	MOT	8,000	1	1			1.1	1969	1973	Total Cost — $35,000
Hydrology Chemistry	Water Quality Survey in Yukon and N.W.T.	Obtain information on the quality of water to assist with water management	Part of Canadian IHD Program	Dept. Fish.-Forestry Inland Water Branch	EMR/Mines Branch UNESCO	145,000	5				5	1965	Continuing	50 water sampling stations in Yukon and N.W.T.
Hydrology Meteorology Geomorphology Mathematics	Hydrology of Mackenzie River and Delta	To study the surface and ground water behaviour of Mackenzie River area in relation to climate and geography	National Waters Resources Program	Dept. Fish.-Forestry Inland Waters Branch	EMR/GSC University of B.C.	185,000	8	11	1	2	8.5 0.5	1965	1975	Includes 4 programs — — Mackenzie Delta Studies G70-1 — Storm in Tributaries G70-4 — Regional Hydrology G70-5 — Mathematical G70-6
Hydrography	Hydrographical survey	Systematic survey of water depths and coast lines of Canadian Arctic Archipelago	Part of National Hydrographic Survey Program	Dept. Fish.-Forestry Cdn. Hydrographic Service	MOT EMR/PCSP	935,000	32	51			39	Continuing		Includes 5 programs. Cost of ships provided by MOT for 2 programs not included
Hydrography	Arctic Tide Gauging Program	Measurement of tidal fluctuations and determination of sea level at selected locations in Arctic Canada		Dept. Fish.-Forestry Cdn. Hydrographic Service		110,000		1		1	1 0.5	Continuing		10 stations in Arctic
Hydrography	Hydrographic Survey	Systematic survey of water depths and coastline of Beaufort Sea	Part of Cdn. Hydrographic Service long-term Charting program	EMR/PCSP	Cdn. Hydrographic Service EMR/Earth Physics Br.	175,000	4	2			3	Continuing		Program closely co-ordinated with Earth Physics studies
Acoustics Hydrography Oceanography Meteorology	Environmental Research in Northern Waters Part of ACN 13	Collection of acoustic, hydrographic and oceanographic data in the channels between the Arctic Islands		DND/DRB	Canadian Armed Forces	560,000	7	7			14	Continuing		

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Oceanography	Research in Arctic Oceanography	Study of seasonal changes in surface waters of Archipelago		Dept. Fish.-Forestry Marine Sciences Br/Frozen Sea Research Group		225,000	10	1			11	Continuing		
Oceanography Acoustics	Acoustics and Oceanography Parts of ACN 39, 40	To study acoustical properties of the sea in and near ice-infested waters		DND/DRB		700,000	5	6			11	Continuing		
Space Physics	Space Radiation Incident on the Earth at High Latitudes	Determine properties — 1. Cosmic radiation 2. Particles responsible for aurora		NRC/Div. of Physics	AECL Several Canadian universities	90,000	2	3			5	1952	1974	Total cost 8-year period $500,000
Plasma Physics	Auroral Plasma Aurora and Airglow	Study plasma density, temperature and fine scale structure in ionosphere and aurora measurements at high resolution of aurora and airglow spectra in photoelectric and infrared regions	Part of general program of research of physics of upper atmosphere	NRC/R&EE Div.	IGY IQSY Byrd Station Antarctica	200,000	5	5			5	1950	1976 at least	Projected 5-year cost $650,000
Space Physics	Range Facilities	To provide complete rocket launch and related facilities	Study of Upper Atmosphere-Space Communications	NRC/Space Range Facilities Branch		1,800,000	3	6	6	47	9 53	Continuing		Scientists from USA, UK, Sweden, Fed. Republic of Germany, and Czechoslovakia use the Churchill Range under terms agreed to by these countries
Geophysics	Great Whale Geophysical Station	Aurora studies — propagation studies		NRC/Space Research Facilities Branch	Dept. of Comm. Stanford U. Environmental Science Serv. Lab. of Nat. Bureau of Standards USA	50,000				3	3	Continuing		
Physics	Radio Propagation in the Arctic Ionosphere	Studies of radio waves, measurements from satellites, ionospheric disturbance regions		DND/DRB		26,000			4		4	1971	1972	Grants to several Universities

EARTH AND PHYSICAL SCIENCES

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Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc' fic	Oth-er	Sc' fic	Oth-er		Start	Finish	
Physiography Forestry	Land Classification — Area Estimates by Air Photo Sampling Methods for Yukon and N.W.T.	To obtain reliable national statistics on forestland and other land classifications	Trial project may be extended nationally	Dept. Fish.-Forestry Forestry Service		11,000	1	1			1	1969	1971	
Paleontology	Study of Pleistocene Vertebrates of Yukon	Collect Pleistocene vertebrate material in an attempt to reconstruct vertebrate history of area during Ice Age		Sec. of State/ National Museums/ Museums of Natural Sciences		4,000	1	1		1	0.5 0.25	1967	1973	

Annex D

ENGINEERING SCIENCES

The total Federal Government expenditure for directed programs in Engineering in Northern Canada for the fiscal year 1971/72 is planned to be:

Funds – $2,717,900

Manpower	Government	Non-Government
Scientific	36	10
Other	106	15
Man-years	78.2	12

Engineering activities are concentrated mainly in two areas, mining, gas and oil resource development and water survey. A total of about $551,000 has been programmed for activities related to mining, gas and oil, and $1,258,000 allotted to the Arctic Water Survey program.

Brief resumés of individual programs are contained in the following pages.

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Metallurgy	Alloys for Icebreaker Propellers	To develop suitable alloys for casting icebreaker propellers		EMR/Mines Branch	MOT	25,000	2	2			1	1970	1972	
Metallurgy	Steels for Arctic use	To develop steels for use in Arctic and to determine methods of processing and maintenance	Part of EMR Minerals and Energy Resources Program	EMR/Mines Branch	National Energy Board	243,000	9	9			9.5	1968	1974	Includes programs: 1. Develop improved pipeline steel 2. Fracture and toughness study 3. Effects of processing on structure steel 4. Low maintenance steel studies
Metallurgy Petroleum	Thermal Stress Analysis of Pipeline and associated facilities under Arctic conditions	Define pipeline requirements to meet thermal stresses expected in the Arctic	Program of Work Studies for the Task Force on Northern Oil Development	National Energy Board	Assisted by Industry — through research projects in Northern Canada	6,000	1				0.25	1971	1972	Project may be extended as more information becomes available
Petroleum	Computer Studies and Programming for Oil Pipe Lines in the Arctic	To determine: Optimum design, construction and operation; maximum temperatures under varying flow rates for purpose of determining effect on permafrost	Mackenzie Valley Pipe Line Studies	National Energy Board		12,000	4				0.55	1970	1972	Study may be extended as pipe line construction research continues
Petroleum Mechanical	Technical requirements for oil and gas pipelines operations in Arctic	To provide guidelines for operation of oil and gas pipelines that traverse the Arctic	Program of Studies for the Task Force on Northern Oil Development	National Energy Board		10,000	2	3			0.5	1971	1971	
Petroleum Mechanical Metallurgy	Specific Requirements for Steel Line Pipe for oil and gas pipe lines in the Arctic	Define requirements for steel alloys and manufacture to ensure suitable line pipe is available for construction of pipe lines	Program of Studies for the Task Force on Northern Oil Development	National Energy Board		2,000	1				0.1	1971	1971	Study will be continued as new information becomes available
Mechanical Metallurgy	Canadian Standards Association Standard													

ENGINEERING SCIENCES

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Mechanical Metallurgy	Canadian Standards Association Standard CSA 2184-1969 – Gas Pipe Lines	To provide engineering and safety data for incorporation in standards for gas pipe line construction in Northern Canada	Program of Studies for the Task Force on Northern Oil Development	National Energy Board Canadian Standard Association		5,000	2				0.2	1971	1972	
Metallurgy	Welding of Steel at Low Temperatures	To develop specifications for welding in the Arctic	Part of EMR Mineral Energy Resources Program MERP	EMR/Mines Branch		40,000	2	2			2	1962	1974	
Economics	Economics of Northern Mineral Industry	To assess present and potential mineral development in terms of their economic and social implications	Part of National Mineral Policy Study	EMR/Mineral Resources Branch	DIAND	58,000		4			4	Continuing		
Civil	Marine Terminal Herschel I.	Feasibility Study	Northern Economic Development	D.P.W.	DIAND EMR	175,000		5		5	5.0 1.5	1970	1972	
Civil	Highway Dust Control Control	To determine most effective and economical dust palliative		Yukon Territorial Government DIAND	DPW	55,000	1	7			4	1970	Continuing	Cost of dust control on Klondike and Campbell Highways for 1971-72 estimated to be $530,000
Civil	Ground Temperatures Faro and Porter Creek	Determine ground temperatures in discontinuous permafrost zone and their influence on design of water-sewage systems and operation		Yukon Territorial Government		1,400	1	1			0.2	1970	Continuing	
Civil Electrical	A study of Engineering Problems in the provision of utilities in northern communities	A review of literature to survey current practices and to assess new technological possibilities		DIAND		10,000			5		3	1971	1972	Grant to University
Civil Architecture	Measured Drawings of Historic Structures	To provide basic data about structures at Dawson, Whitehorse and Lake Bennet to serve as a starting point in planning their preservation or restoration	Part of a program to record and preserve historic sites	DIAND		20,000	2	2			2.3	1970	1972	

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Architecture	Frobisher Bay Vocational School	Evaluate new type of wall construction		DIAND DPW		incl. in bldg. contract		1			1	1970	1972	
Electronics	Northern Control Area Automation	Determine parameters of an automatic air traffic control system for Northern Canada		Ministry of Transport — Air Transport Admin.		24,000		Not provided				1970	1972	Estimated total expenditure shown
Electronics	Evaluation of Omega Navigation System in Canadian Arctic	Obtain data on sky wave corrections, effect of ionospheric disturbances on signals		Ministry of Transport — Dir. Tel-Elect.		20,000		Not provided				1970	1971	Originally started 1967
Electronics	Long Range Low Cost Position Locating Device	To develop a locating device for travellers in the North		Ministry of Transport — Dir. Tel-Elect.		41,000		Not provided				1970	1975	Estimated total expenditure shown
Electronics	Remote Measuring of Ice Thickness by Airborne Reconnaissance	Improve ice reconnaissance		Ministry of Transport Dir. Tel-Elect.		20,000		Not provided				1970	1975	Estimated total expenditure shown
Mechanical Electrical	Remote Location Generating Units	To provide small economic generating units at remote sites		Ministry of Transport — Dr. Const. Eng. & Arch.		7,500	1				0.5	1969	1971	Total expenditure $20,000
Chemistry Physics	Electrical Power Sources Part of ACN 27	Design of electrochemical cells for operation at low temperatures		DND/DRB	Canadian Armed Forces	250,000	4	8			12	Continuing		Partly financed by Canadian Armed Forces
Mechanical	Off-Road Transport	Development of an off-road transportation vehicle	Program for the Advancement of Industrial Technology	Dept. of I.T. & C.	Private enterprise	15,000		not known				1970	1972	Additional $15,000 provided by private enterprise.
Hydrology	Arctic Water Survey	Collection of information on water levels, stream flow and sediments in selected streams	Part of Water Survey of Canada	Dept. Fish.-Forestry — Inland Waters Branch	DIAND	1,258,000	1	32			30	Continuing		Approx. 20% of funds provided by DIAND 38 stations in Yukon, 64 stations in N.W.T.

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc' fic	Oth-er	Sc' fic	Oth-er		Start	Finish	
Hydrology Civil Electrical	Hydro-Electric Power Inventory Studies	Identify and make preliminary capacity and cost studies of hydro-electric power sites in Yukon and N.W.T.	Associated with DIAND responsibility under Dominion Water Power Act	DIAND	NCPC	150,000			5	10	7.5	1967	1972	One more study required to complete project.
Chemistry Metallurgy	Explosives and Ordinance ACN 51, 57 (Parts)	Determine: Composition and efficiency of explosives in cold weather; penetration of ice by shaped charges		DND/DRB	Canadian Armed Forces	270,000	3	3			6	Continuing		

Annex E

HEALTH SCIENCES

The total Federal Government expenditure for directed scientific activities in the Health Sciences in Northern Canada for the fiscal year 1971-72 is planned to be:

Funds – $95,000

Manpower	Government	Non-Government
Scientific	2	14
Other	–	–
Man-years	2	2.5

The Northern Health Service program sponsored by the Department of National Health and Welfare is the only scientific activity reported in the Health Sciences field. There are, however, several multi-disciplinary programs (Annex G) sponsored by the Department of National Defence which include Health Sciences.

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Medicine – Respiratory disease – Cardio-vascular disease – nutrition – metabolism – epidemiology – parasitology – immuno-genetics	Northern Health Service	Promotion of healthful living		N.H.&W.	Terr. Govts. Universities – McGill, Ottawa, Queen's Western, Toronto, Alberta, B.C., Manitoba	95,000	2		14		2 2.5	Continuing		$46,500 of total for contracts and grants to universities

Annex F

SOCIAL SCIENCES

The total Federal Government expenditure for directed scientific activities in the Social Sciences in Northern Canada for the fiscal year 1971-72 is planned to be:

Funds – $449,300

Manpower	Government	Non-Government
Scientific	34	22
Other	15	22
Man-years	34.9	3.7

The Social Science programs can be grouped into four main areas, Historical (including Archaeology and Anthropology), Economics, Socio-Economics and Anthropology-Sociology. About $192,000 has been allotted to Historical type studies, $98,000 to Economics, $82,000 to Socio-Economics and $55,000 to Anthropology-Sociology studies.

Brief resumés of programs are contained in the following pages.

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Sociology Economics	Study of Socio-Economic Development in Greenland	To compare the Greenland experience with that of Canada		DIAND		25,000	1	1			1.25	1970	1972	Exchange arrangement with the Danish Authorities
Sociology Anthropology	Study of Ethnic Identification and Integration in Whitehorse, Y.T.	To provide information and analysis for policy and administration purposes	Supplementing a study of modernization among native people in north	DIAND	McGill University	5,000			1		0.5	1970	1971	Contract with university
Sociology Anthropology Human Geography	Problems of modernization among native people in the north	To identify and analyse problems relevant to DIAND's responsibility for northern development		DIAND		50,000	2	3			3	1971	1971	
									1		1			
Anthropology Ethnology	Arctic Program — Eskimo Ethnological Research	Record traditional and other aspects of culture of the Eskimo	Part of program to record traditional and other aspects of the native peoples of Canada	Sec. of State, National Museums, Museum of Man		20,000	1	1			2	1971	Continuing	
Anthropology Archaeology (sub-discipline)	Eskimo Pre-history	Develop a knowledge of the pre-history of the Eskimo	General program of developing a knowledge of pre-history of Canada and its people	Sec. of State, National Museums, Museum of Man	Universities under contract	31,000	1	1			2.4	1948	Continuing	
									9	5	1.6			
Anthropology Archaeology (sub-disc.)	Northern Western Boreal Forest Pre-history	Develop a knowledge of the pre-history of the habitat and of the area	General program of developing a knowledge of pre-history of Canada and its people	Sec. of State, National Museums, Museum of Man	Contract personnel	60,000	2	3			3.75	1940	Continuing	
									2	5	0.8			
Anthropology Ethnology (sub-disc.)	Ethnological Research Contract Program	Ethnological research among Athabaskan Indians and Eskimos	Part of program to record traditional and other aspects of the native people of Canada	Sec. of State, National Museums, Museum of Man	Contract personnel	10,000			8		1	1965	Continuing	

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc' fic	Oth-er	Sc' fic	Oth-er		Start	Finish	
Anthropology Ethnology	Athabaskan Program	Record traditional and other aspects of culture of Northern Indians of Athabaskan linguistic stock	Part of program to record traditional and other aspects of native people of Canada	Sec. of state, National Museums, Museum of Man		41,000	2	2			4	1965	Continuing	
Economics	Incentive Programs	Evaluation of incentive program operating in north		DIAND		7,000	1				0.65	1971	1972	
Economics	Taxation Study	Study implications of Carter Commission Report and White Paper on Taxation	Northern Economic Development	DIAND		7,000	1				0.5	1971	1971	
Economics	Fort Providence Bridge	Study economic feasibility of bridge over Mackenzie River	Northern Economic Development	DIAND		4,000	1				0.3	1971	1971	
Economics Sociology	Canol Road-Pelly River Crossing Study	Compare costs and benefits of building a connecting road from Faro to Canol Road or bridge over Pelly River at Ross River	Northern Economic Development	DIAND		1,000	1				0.1	1971	1971	
Economics Sociology	Towards a Social Accounting System for Regional Planning	Provide a framework for collection of planning data	Northern Economic Development	DIAND		6,000	1				0.5	1970	1972	
Economics Sociology	Social Indicators for the North	Supply indicators of non-economic phenomena related to northern development	Northern Economic Development	DIAND		10,000	1				1	1970	1972	
Economics Sociology	Socio-Economic Impact of Mackenzie River Pipeline	Study socio-economic impact of Mackenzie River Pipeline	Northern Economic Development	DIAND		36,000	3				3	1971	1972	
Economics	Statistical Compendium for the North	Collection of data required for development planning	Northern Economic Development	DIAND		4,000	1				0.5	1971	1971	
Economics	Sectorial Studies of the Northern Economy	Evaluation of proposals for economic development of Arctic regions	Northern Economic Development	DIAND		12,000	1				1	1971	Continuing	Studies will make use of model develop by G.D. Quirin of U. of Toronto under contract

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc' fic	Oth-er	Sc' fic	Oth-er		Start	Finish	
Economic Sociology	Analyses of Manpower Survey Data	Analyses of manpower survey data	Northern Economic Development	DIAND		4,000	1				0.3	1971	1971	
Economics	A Strategy for Economic Development of Northern Territories	Outline of development approach as a guide to economic growth	Northern Economic Development Program	DIAND		45,500	5				3.5	1970	1972	
Economics	Costs and Benefits of Bringing Baffin Island Iron Ore into Production	Study socio-economic effects of bringing the deposits into production	Northern Economic Development Program	DIAND		13,000	2				1	1970	1971	
Economics	Transportation and Supply Study of Far North	Produce a comparison of alternative supply routes to north	Northern Economic Development Program	DIAND Contracted to a firm of consultants	M.O.T. E.M.R.	13,500		not known				1970	1971	Contract study concerned only with transport — action of supplies to exploration sites. Total cost of project $30,000 Eleven oil companies paying balance
Recreational Geography	Outdoor Recreation Potential in the N.W.T.	Identify and classify landscape regions according to their recreational potential considering geographical aspect only	Part of "Overview of Tourism and Outdoor Recreation in the N.W.T."	N.W.T. Govt.	Dept. of Regional Economic Expansion	12,000	1	1			0.75	1970	1971	
Recreation	Canadian Travel Survey	To determine travel habits of Canadians in north	Part of Canada-wide Travel Survey	Dept. I.T.C. Office of Tourism	N.W.T. and Yukon Govt.	1,000		not known				1971	1971	
History	Historical Research — Yukon	Develop knowledge of Historic Sites	Development of National Historic Sites in Yukon	DIAND		30,000	5	3			4	1966	1977	
Communication	Radio-TV Survey	Survey of Radio-TV audiences to improve scheduling		CBC		1,000			1	12	0.3	1971	1971	

Annex G

MULTI-DISCIPLINARY SCIENTIFIC ACTIVITIES

The total Federal Government expenditure for directed multi-disciplinary scientific programs in Northern Canada for the fiscal year 1971-72 is planned to be:

Funds – $5,241,610

Manpower	Government	Non-Government
Scientific	135	52
Other	127	51
Man-years	184.4	43.5

Multi-disciplinary programs that include Biological and Earth and Physical Sciences and Engineering account for about $1 million of the funds assigned to multi-disciplinary scientific activities. Biological-Earth and Physical-Social Sciences programs are allotted $922,000. The Social Sciences content of these activities is primarily in the field of economics relating to resources development. Approximately $1.9 million are programmed for Earth and Physical-Engineering activities, with about $1.2 million of this sum allotted to communications. Programs that included Biological and Social Sciences and Engineering are earmarked for about $1.2 million. Three programs in this group, totalling $316,000 and sponsored by the Department of National Defence, include Health Sciences.

Brief resumés of multi-disciplinary scientific activities are contained in the following pages.

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Biological Earth & Physical Engineering	Arctic Land Use Research Program (ALUR)	Compile base-line data on undisturbed ecosystems and by manipulation to detect and define land use environmental problems — Devise and test alternative land use operational procedures and recommend degree of restriction to be imposed in land use operations to protect natural environment	Support of Water, Forest and Land Management Program	DIAND	EMR/GSC Dept. Fish.-Forestry/ Universities: Alta B.C. Sask. Laval Brock N.B. Carleton	930,000	1	2	25	5	3 15	1970	Continuing	A capital expenditure of $150,000 is included. Program includes following studies 1. Off-road transportation and seismic disturbance 2. Environmental classification 3. Disturbance studies related to forest industry 4. Mine waste containment and water quality standards 5. Terrain sensitivity mapping 6. Land based oil spills 7. Waste disposal 8. Data bank and bibliography
Biological Earth and Physical Engineering	Investigation of oil spills on tundra	To provide basic scientific information about the effect of oil spills on land in the Arctic	Support to Arctic Land Research (ALUR) Program	DIAND	University of Ottawa	20,000			6		4	1971	1972	Grant to university
Biological Earth and Physical Social	Mackenzie River Valley Socio-economic study of Transportation	Provide transportation decision inputs concerning improvement and/or expansion of transportation systems	Arctic Transportation Program	Ministry of Transport Transport Development Agency DIAND EMR	NTCL CTC	125,000	2		3	2	1 1.5	1971	1971	This study to be followed by a more complete long term study of Arctic transportation
Earth and Physical Engineering	Soils and Terrain	Study properties of terrain, soils, muskeg, permafrost — related to vehicle mobility and aircraft landing problems		DND/DRB	Universities	28,000			5		5	Continuing		Grants to universities
Earth and Physical Engineering	Physical Properties of Terrain	Distribution, physical and mechanical properties and permafrost and frost susceptible soils to establish correct const. of foundation and anchorage practices. Properties of predicting ice break-up dates for ice covered bodies of water.	Research applied to	NRC/ Bld. Res.		375,000	7	6			11	1959	Continuing	Projected 5 year cost $1,875,000

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Earth & Physical Engineering	Task Force on Northern Oil Development	Bring together all information on oil, and transportation routes that might be used to develop northern oil and gas resources		EMR DIAND Ministry of Transport Fish. & Forestry National Energy Board		380,000	50	6			20	1968	Continuing	Task Force responsible for advising government on matters relative to northern oil and gas development. Cost and man-power estimates only reflect organization and co-ordinating structure and feasibility studies by staff. No field work included
Biological Earth & Physical Engineering Social	Environmental guidelines for oil and gas pipelines in the Arctic	Determine and define requirements to be met by applicants for pipeline construction and operation in the Arctic	Mackenzie Valley Oil and Gas Pipeline Studies	Task Force on Northern Oil Development including: EMR DIAND MOT Fish & For. NEB		6,000	2	3			0.25	1970	1972	
Biological Earth & Physical Engineering Social	Gas and Oil Pipeline Regulations and Guidelines	Development and preparation of regulations for gas and oil pipelines in Northern Canada to cover those additional requirements for protection of the environment and low temperature conditions		Task Force on Northern Oil Development NEB		50,000	8	6			2	1971	1972	
Biological Earth & Physical Social	Northern Resources Research Project — Phase 1	Collection and interpretation of data concerning the Yukon	Northern Resources Research Project	Yukon Territorial Government	Univ. Alta Boreal Institute	15,000			5	1	6	1971	1972	
Earth & Physical Engineering	Sensors for Surveillance ACN 15 (Part)	Research towards design of optical, infrared and acoustical sensors for surveillance		DND/DRB	Canadian Armed Forces	250,000	4	4			8	Continuing		
Earth & Physical Engineering	Study of Behavior and Dispersion of Material and Energy introduced into the Arctic atmosphere	Obtain information and to recommend appropriate steps to maintain quality of the atmosphere	Part of EMR/ Mines Br. Smoke Abatement and Plume Dispersal Program	EMR/Mines Branch	Cdn. Met. Service	60,000	3	6	1	3	4 0.5	Continuing		

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Engineering Social	Casino Silver Mines Ltd.	Engineering and financial evaluation of project	Northern Economic Development	DIAND		7,000	1				0.5	1971	1971	
Social Engineering	Studies in Northern Town Planning	To provide guidance in planning development of population centres		DIAND	University of Toronto	23,000			4		3	1971	1972	Contract with university
Engineering Social	Study of Remote Settlements	To acquire a better understanding of the factors that help or hinder the growth of remote settlements		CMHC	Grant to Center for Settlement Studies University of Manitoba	120,000			Not available			1969	Continuing	The three priority areas of study are: Housing, Work Force Native People
Social Engineering	Northern Development in the USSR	To keep abreast of USSR technology and socio-economic responses to northern problems		DIAND		18,000	1	1			1.25	Continuing		
Biological Health Social	Arctic Medicine and Climatic Physiology	Physiology of humans at low temperatures		DND/DRB		31,000			5		5	1971	1972	Grants to universities
Biological Engineering Health Social	Human Factors and Physiological Research Parts of ACN 47, 49, 51	Study human capability in cold environment and man/machine effectiveness in Arctic operations		DND/DRB	Institute of Aviation Medicine	220,000	5	6			11	Continuing		
Engineering Health Social	Environmental Protection ACN (33) Part	Improvement of protective clothing and personal equipment of military personnel operating in the Arctic		DND/DRB	Canadian Armed Forces	65,000	2	1			3	Continuing		
Biology Engineering Social	Improvement of fishing techniques and equipment and development of new fisheries	Perform exploratory fishing to determine commercial fishing possibilities in selected areas — Determine whether recreational fishing for lake trout could be developed in new fresh-water areas	Part of Industrial Development Program	Dept. Fish.-Forestry Fisheries Service	N.W.T. Government	45,000			2		0.5	1971		$30,000 for charter of vessel for 3 months. If preliminary trial fishing successful program will continue to explore whole of Hudson Bay

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Oth-er	Sc'fic	Oth-er		Start	Finish	
Biological Social	Evaluation of importance to and needs for wildlife of the people of Old Crow	Evaluate in economic and social terms dependence of Old Crow people on wildlife and to determine size of annual harvest required.	Similar studies conducted in Mackenzie Delta	Dept. Fish.-Forestry CWS — Western Region		21,700			1		0.5	1971	1972	
Biological Engineering	Ecological Evaluation of Peace — Athabasca Delta	Describe succession in depleted Delta to permit better prediction of ecological effects of river engineering	Research in support of habitat assessment with particular relevance to problems of river impoundment and diversion	Dept. Fish.-Forestry CWS — Western Region	NRC — U. of Sask. (contract)	62,910	1	1	1		2 1	1967	1972	
Biological Earth & Physics Engineering	Technological Research to improve quality of fish products FRB 905	Increase utilization of northern freshwater fishery resources	Technological Program on Fresh Water Fishes of Central and Northern Canada	Dept. Fish. Forestry FRB/Freshwater Inst.	Provincial Agencies Industry Fresh Water Fish. Marketing Corp.	21,000	1				1	1966	Continuing	
Biological Engineering	Management and Development of Fisheries Resources of Northern Canada	To develop and manage the application of scientific and technical measures for effective utilization of fish stocks	Part of Res. Dev. Program of Canadian Fisheries Service	Dept. Fish. Forestry Fisheries Service	Territorial Governments DIAND CWS	168,000	5	7			12	1949	Continuing	
Biological Engineering	Maintenance protection and improvement of physical and biological environments of northern fisheries resources	To develop and apply scientific and technical measures to protect and improve the environment of fisheries resources of the north	Part of Resources Dev. Prog. of Cdn. Fisheries Service	Dept. Fish.-Forestry Fisheries Service	Territorial Governments DIAND CWS	440,000	8	10			18	1970	Continuing	
Biological Engineering	Research and Technical Operations to ensure quality in products from northern fisheries	To formulate standards to ensure quality of processed fish	Part of activities of Inspection Service of Fisheries Services	Dept. Fish.-Forestry Fisheries Service	DIAND	84,000	2	11			8.5	—	Continuing	

Discipline	Title	Objective	Relationship to Larger Program	Sponsor	Affiliated and Associated Agencies	Cost	Manpower					Duration of Program		Comments
							Gov't		Non-Gov't		Man-Yrs.			
							Sc'fic	Other	Sc'fic	Other		Start	Finish	
Earth & Physical Engineering	Radar, Communications, and Electronics Parts of ACN 31, 35, 37	Design and trial of mobile communications systems; Radar for surveillance; Investigate characteristics of the propagation medium	Canadian Communications Program	DND/DRB	Dept. of Communications CRC	335,000	3	2			5	Continuing		
Earth & Physical Engineering	Northern Communications	To improve and expand communications in the north	Canadian Communications Program	Dept. of Communications/CRC	DND/DRB	915,000	16	47			62	Continuing		
Social Biological Earth & Physical	Wild River Study Yukon Terr. and N.W.T. (Mackenzie area)	To continue 2nd phase of Wild River Study	Expansion of National Parks System in Canada	DIAND/ National Parks		315,000	3		1	40	0.5 7	1970	Continuing	DND may provide logistic assistance
Social Biological Earth & Physical	Forty-Mile River Study	Wild River Study in conjunction with U.S.	Expansion of National Parks System in Canada	DIAND	U.S. Bureau of Land Management	1,000	1				0.1	1971	1971	
Social Biological Earth & Physical	Field Study — Great Bear Lake	To assess Park potential of an area on east side of Great Bear Lake	Expansion of National Parks System in Canada	DIAND		10,000	2				0.5	1971	1972	
Social Biological Earth & Physical	New National Parks Studies Northern Canada	Identify and select representative landscape features of northern Canada to ensure both adequate and appropriate representation of northern Canada in the National Parks System	Expansion of National Parks System in Canada	DIAND		20,000	2				1	1971	Continuing	
Engineering Social	Military Operations and Analysis	Study efficiency of various military operations, estimate value and feasibility of proposed operations		DND/DRB	Canadian Armed Forces	80,000	5	1			6	Continuing		

Annex H

GRANTS TO UNIVERSITIES AND INSTITUTES FOR UNDIRECTED SCIENTIFIC ACTIVITIES IN NORTHERN CANADA 1971-72

Three agencies, National Research Council, Canada Council and the Department of Indian Affairs and Northern Development are providing about $2,288,000 in grants for undirected scientific activities in Northern Canada during 1971-72. Included in the total are $45,000 granted to the Arctic Institute of North America to assist with the publication of the Arctic Bibliography.

GRANTS TO UNIVERSITIES AND INSTITUTES FOR UNDIRECTED SCIENTIFIC ACTIVITIES IN NORTHERN CANADA 1971-72

Annex H

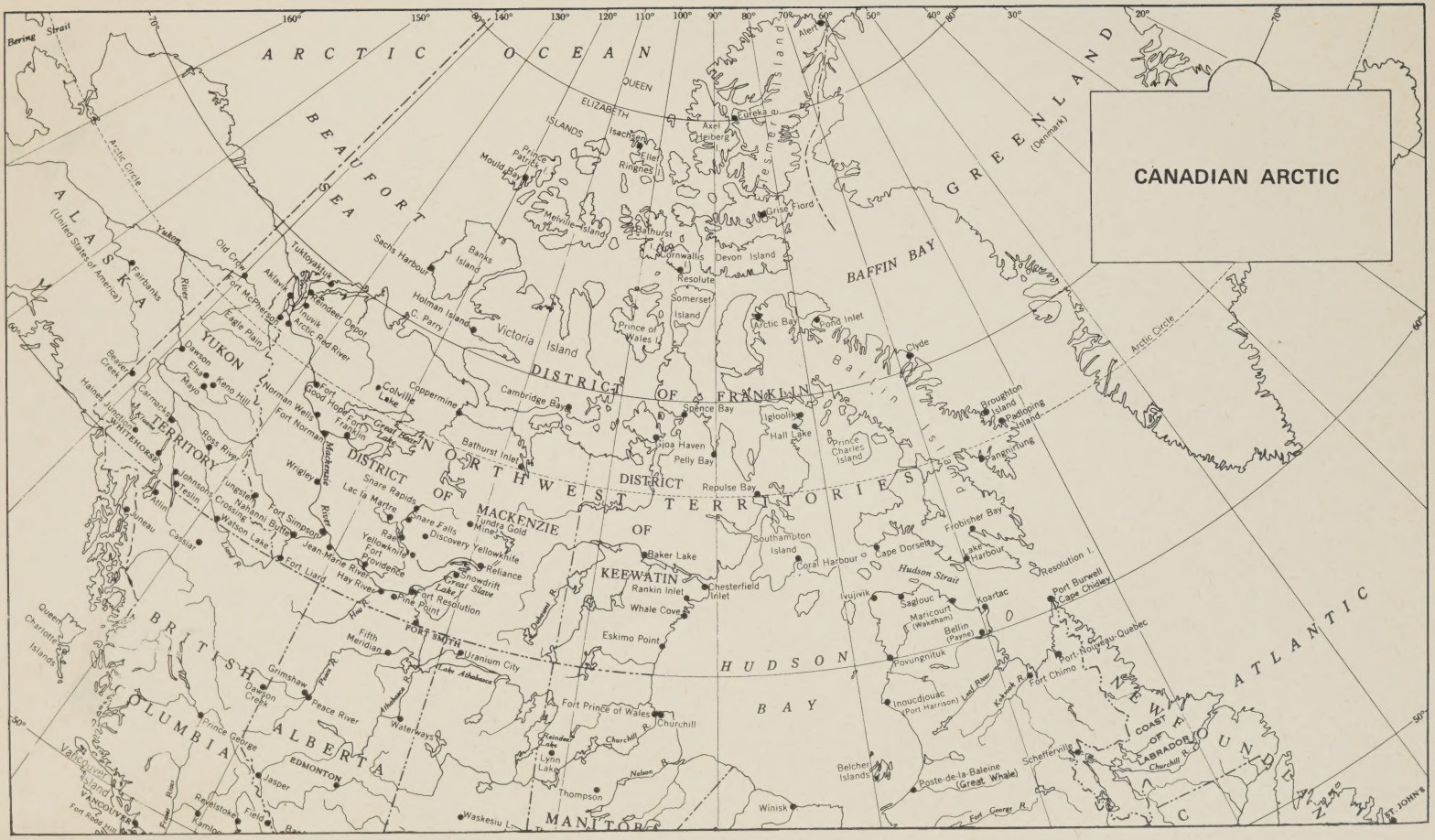
Agency	Estimate of Funds made Available	Comments
National Research Council	$1,800,000	Based on previous years experience practically all funds will go to support research in Biological, Earth and Physical Sciences.
Canada Council	183,000	Canada Council grants supporting Northern Research totalled $366,505 for the two fiscal years 1969 to 1971. Practically all funds support work in Archaeology, Geography and Sociology; also included is a grant of $15,000 to the Arctic Institute of North America in 1971 for publication of the Arctic Bibliography.
DIAND	305,000	The Department of Indian Affairs and Northern Development awarded grants amounting to $275,000 to northern institutes and northern scientific expeditions on the basis of research plans submitted by these agencies. These plans cover research in all scientific disciplines. In addition, a grant of $30,000 was provided to the Arctic Institute of North America to assist with publication of the Arctic Bibliography.

APPENDIX C

Revenues and Expenditures in the North
Fiscal Year 1970-71

	Northwest Territories		Yukon Territory	
Department or Agency	Revenues	Expenditures	Revenues	Expenditures
Agriculture		45,240		5,360
Central Mortgage and Housing	1,091,838	3,333,186	1,388,504	3,381,162
Communications		406,928	9,425	32,309
Crown Assets and Disposal	241,974		333,872	
Energy, Mines and Resources		488,484		89,680
Environment	58,000	5,402,188		786,279
Indian Affairs and Northern Development	8,212,662	38,462,406	2,180,990	8,881,196
Justice	72,567	322,555	118,214	235,880
Manpower and Immigration		1,521,064		738,385
Ministry of Transport	4,939,028[1]	23,732,035[1]		
National Defence		41,000		
National Health and Welfare	1,708,210	8,672,712	1,411,064	2,751,645
National Museums of Man	12,100	12,100	1,400	1,400
National Research Council		930,000		300,000
National Revenue			451,633	210,501
Northern Canada Power Commission	7,711,515	11,726,199	2,868,478	4,394,907
N.W.T. Government	61,848,970	72,237,464		
Post Office	392,526	1,900,019	318,537	1,120,568
Public Works	540,100	3,488,560	696,000	9,159,000
Royal Canadian Mounted Police	1,290,806	2,753,769	77,955	1,107,542
Yukon Government			25,334,443	19,442,843

[1]Both Northwest Territories and Yukon Territory are included in these figures.


CANADIAN ARCTIC
ARCTIC OCEAN
BEAUFORT SEA
QUEEN ELIZABETH ISLANDS
BAFFIN BAY
GREENLAND (Denmark)
HUDSON BAY
ATLANTIC OCEAN
ALASKA (United States of America)
YUKON TERRITORY
DISTRICT OF MACKENZIE
NORTHWEST TERRITORIES
DISTRICT OF FRANKLIN
KEEWATIN
BRITISH COLUMBIA
ALBERTA
MANITOBA
NEWFOUNDLAND
LABRADOR
Bering Strait
Arctic Circle
Alert
Eureka
Axel Heiberg
Ellef Ringnes
Prince Patrick
Mould Bay
Melville Island
Bathurst
Grise Fiord
Ellesmere Island
Cornwallis Island
Devon Island
Resolute
Somerset Island
Prince of Wales
Arctic Bay
Ford Inlet
Clyde
Baffin Island
Broughton Island
Padloping Island
Pangnirtung
Frobisher Bay
Lake Harbour
Cape Dorset
Resolution I.
Port Burwell
Cape Chidley
Koartac
Port Nouveau Quebec
Fort Chimo
Kaniapiskau R.
Leaf Rapids
Churchill R.
Schefferville
Poste-de-la-Baleine (Great Whale)
Belcher Islands
Winisk
Fort George R.
St. John's
Hudson Strait
Ivujivik
Sagiouc
Maricourt (Wakeham)
Bellin (Payne)
Povungnituk
Inoucdjouac (Port Harrison)
Coral Harbour
Southampton Island
Repulse Bay
Chesterfield Inlet
Rankin Inlet
Whale Cove
Eskimo Point
Baker Lake
Igloolik
Hall Lake
Prince Charles Island
Spence Bay
Pelly Bay
Igloo Haven
Cambridge Bay
Victoria Island
Holman Island
C. Parry
Banks Island
Sachs Harbour
Tuktoyaktuk
Aklavik
Inuvik
Arctic Red River
Fort McPherson
Old Crow
Fairbanks
Yukon River
Eagle Plain
Dawson
Elsa
Mayo
Keno Hill
Beaver Creek
Haines Junction
Whitehorse
Carmacks
Ross River
Norman Wells
Fort Norman
Fort Good Hope
Colville Lake
Coppermine
Great Bear Lake
Great Slave Lake
Fort Franklin
Mackenzie River
Wrigley
Fort Simpson
Jean Marie River
Hay River
Fort Liard
Fort Providence
Yellowknife
Rae
Lac la Martre
Snare Rapids
Snare Falls
Discovery
Yellowknife
Reliance
Snowdrift
Fort Resolution
Pine Point
Fort Smith
Fifth Meridian
Uranium City
Lake Athabasca
Peace River
Grimshaw
Dawson Creek
Prince George
Waterways
Fort Prince of Wales
Churchill
Churchill R.
Thompson
Nelson R.
Lynn Lake
Waskesiu L.
Edmonton
Jasper
Revelstoke
Field
Vancouver Island
Vancouver
Fort Rupert
Queen Charlotte Islands
Juneau
Cassiar
Watson Lake
Johnsons Crossing
Teslin
Tungsten
Hahanni Butte
Liard R.
Hess R.
Athabasca R.
Klinaklini R.
Labrador Coast